GOVERNMENT OF ODISHA

DEPARTMENT OF WATER RESOURCES

EIA STUDY

(ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT)

OF

RENGALI IRRIGATION SUBPROJECT

LBC- II PHASE- II

FOR JICA FUNDING ASSISTANCE



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Abbreviations

AA	- Administrative Approval
AEO	- Agricultural Extension Officer
AF	- Affected Families
AIBP	- Accelerated Irrigation Benefit Programme (Govt. of India)
AIP	- Agricultural Intensification Programme
AISLUS	- All India Soil & Land Use Survey
BC ratio	- Benefit Cost ratio
CAD&WM	- Command Area Development and Water Management
CADA	- Command Area Development Authority
CAMPA	- Compensatory Afforestation Management Planning Authority
CATP	- Catchment Area Treatment Plan
CCA	- Culturable Command area
CD	- Cross Drainage
CDMO	- Chief District Medical Officer
CE	- Chief Engineer
CE&BM, BLB	- Chief Engineer & Basin Manager, Brahmani Left Basin
CGWB	- Central Groundwater Board
CPCB	- Central Pollution Control Board
CRRI	- Central Rice Research Institute
Crs	- Crores
Cumsec	- Cubic Meter Per Second
CWC	- Central Water Commission
DEA	- Department of Economic Affairs (Govt. of India)
Dept	- Department
DF	- Displaced Families
DFO	- Divisional Forest Officer
DoH	- Department of Health
DoWR	- Department of Water Resources (Govt. of Odisha)
DPR	- Detailed Project Report
EC	- Environmental Clearance
EE	- Executive Engineer
EFR	- Elephant Friendly Ramps
EIA	- Environmental Impact Assessment
EL	- Elevation
EMP	- Environmental Management Plan
EPA	- Entry Point Activities
ESMP	- Environmental And Social Management Plan
FAO	- Food & Agriculture Organization
FC	- Forest Clearance
FSD	- Full Supply Depth

FSL	- Full Supply Level
FYM	- Farm Yard Manure
GOI	- Government of India
GOO	- Government of Odisha
GWL	- Ground water Level
ha	- Hectare
HR	- Head Regulator
I&P	- Irrigation and Power
ICMR	- Indian council of Medical Research
IFFCO	- Indian Farmers Fertilisers corporation
IFS	- Indian Forest Service
IMD	- Indian Meteorological Department
INM	- Integrated Nutrient Management
INR	- Indian Rupees
IUCN	- International Union of Conservation for Nature and Natural Resources
JICA	- Japan International Co operation Agency (TOKYO/JAPAN)
km	- Kilometre
KVK	- Krishi Vigyan Kendra
LA	- Land Acquisition
LAO	- Land Acquisition Officer
LBC	- Left Bank Canal
M	- Meter
m/s	- Meter Per Second
MCP	- Malaria control Program
MDR	- Major District Road
MNREGS	- Mahatma Gandhi National Rural employment Guarantee Scheme
MMM	- Malaria Mitigation Measures
MoEF	- Ministry of Environment and Forests (Govt. of India)
MSL	- Mean Sea Level
MW	- Mega Watt
NGO	- Non-Govt. Organisation
NK	- Nippon Koei
NRHM	- National Rural Health Mission
O&M	- Operation and Maintenance
OFD	- On Farm Development
OSDMA	- Orissa State Disaster Management Authority
OUAT	- Orissa University of Agriculture and Technology
PAP	- Project Affected People
PBME	- Project Benefit Monitoring and Evaluation
PCCF (WL)	- Principal Chief Conservator Forest (Wild life)
PFA	- Prevention of Food Adulteration
PIM	- Participatory Irrigation Management
PLEMC	- Project Level Environmental Management Committee

PMC	- Project Management Committee
PMU	- Project Management Unit
PPP	- Public Private Partnership
PPC	- Plant Protection Chemicals
PPV	- Peak Particle Velocity
PRA	- Participatory Rural Appraisal
Qntl	- Quintal
RBC	- Right Bank Canal
RDC	- Revenue Divisional Commissioner
RF	- Reserved Forest
RIP	- Rengali Irrigation Project
RMRC	- Regional Medical Research Centre
rms	- Root Mean Square
RPM	- Revolution Per Minute
RRP	- Rehabilitation & Resettlement Plan
SAR	- Sodium Absorption Ratio
SC	- Scheduled Caste
SE	- Superintending Engineer
SGSY	- Sampurna Gramina Sworojagar Yojana
SHG	- Self Help Group
SHM	- Stake Holders' Meetings
SJSRY	- Swarna Jayanti Swarozgar Yojana
SPCB	- State Pollution Control Board
Spl	- Special
sq.kms	- Square Kilometre
ST	- Scheduled Tribe
TAC	- Technical Advisory committee
TBM	- Tunnel Boring Machine
ToR	- Terms of Reference
UNO	- United Nations Organization
U/S	- Under Section
VAW	- Village level Agricultural Workers
WALMI	- Water and Land Management Institute (DoWR)
WPA	- Wildlife Protection Act
WRB	- Water Resource Board
WRCP	- Water Resources Consolidation Project
WUA	- Water Users Associations
WBM	- Water Bound Macadum

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EXECUTIVE SUMMARY

BACKGROUND:

Department of water resources (DoWR) in Government of Odisha has taken up implementation of Rengali Irrigation Project on Brahmani river during 1995 – 96 to provide benefits of irrigated agriculture and food security to the people in five districts. The scheme envisages total irrigation potential of 2,18,392ha. to be created through two major canal systems namely Left Bank Canal (LBC) for 1,14,300ha. and Right Bank Canal (RBC) for 1,04,092ha. Due to resource constraint, the State Government preferred to split the huge works into subprojects and phases and have availed external funding for each subproject.

The present document deals with status of implementation of Left Bank Canal (LBC) only.

PHASING OF LEFT BANK CANAL & FUNDING STRATEGY

Subproject	Phase	RD(Km)	CCA (ha)	Funding Source
LBC I	----------	00 to 29.177	12157	World bank (WRCP)
LBC II	Phase – I	29.177 to 71.313	29176	JICA (formerly known as JBIC)
LBC II	Phase – II	71.313 to 141.00	72967	JICA (Proposed)
Total LBC	**3 Subproject**	**141Km**	**1,14,300**	

A. SUBPROJECT STATUS:

Development in irrigation in subproject LBC-II (From 29.177km to 141.00km) is phased as mentioned earlier. The status of implementation is as follows.

- LBC-II Phase-I - [From 29.177 km to 71.313.00km] – Ayacut 29176 ha CCA
  - Civil construction works of 42.136 km long main canal and its distribution system have been completed through JICA funding assistance by the year 2013.

B. REVIEW OF IMPLEMENTATION & CONSULTANCY SUPPORT:

The subproject RIP- LBC-II Phase-I (from 29.177 km to 71.313 km) was undertaken by DoWR during 1997 through external funding assistance extended by OECF subsequently by JBIC later renamed as Japan International Co-operation Agency (JICA), Japan.

Government of Odisha in various phases of project implementation has engaged National and International level consultants to sort out problematic issues and advice/ assist the DoWR authorities for successful implementation of the project till completion.

Some of those credible Reports which have been consulted to provide Road map for future action plan related to implementation of LBC-II Phase-II (from 71.313 to 141.00 km); are mentioned below

STUDIES ALREADY CONDUCTED BY CONSULTANTS

- **WAPCOS** - Env. Report of Flora and Fauna – Sept 1996
- **WAPCOS** – Env. Management Plan – Oct 1996
- **WAPCOS** – Conservation & Management of Wildlife - Nov 1996
- **NK-WAPCOS**– Review report on Env. Aspects LBC-II, Phase-I - April 2000
- **PCCF (WL)** – Action plan for mitigation measures for Conservation and Management of wildlife- Nov 2007/Feb 2008
- **NK-WAPCOS** – Malaria mitigation measures in Rengali Irrigation Project- Sept 2007
- **NK-WAPCOS** – Malaria mitigation measures in R.I.P annual & final report for the year 2009-10 - April, 2011.
- **CE&BM, BLB** – Implementation of stipulated environment safeguard measures on RIP (47th meeting of National Environment Monitoring Committee for River Valley Projects on 13th Sept. 2002)

The project authorities have restructured the strategy with 'Lessons Learnt' exercises from the completion reports prepared by the above consultants.

Some of those key lessons learnt aspects are summarized below:

C. LESSONS LEARNT ASPECTS AND ADVANTAGES OVER COMPLETED PHASE

- The lessons learnt from several impediments in progress of works are briefly outlined below.

Comparative Situations:

Items Considered	For Phase I works (Completed)	For Phase II works (Proposed)
I. Land Acquisition	• In the LA process additional Land were necessary: • Legal problem faced during LA process	LA process is already in advanced stage.
II. Delay in finalization of Design & Drawings	Progress of work delayed due to design finalization of cut & cover portion.	Design & Drawings for major Aqueduct over Damsalla nalla finalized.
III. Forest Clearance	Stage II FC was accorded in 2003 but Tree felling abnormally delayed.	• Forest clearance is in the advance stage at present • Joint verification & Public Consultations have almost been completed.

IV. Organizational Setup	Creation of additional establishment was delayed.	PMU structure already agreed by DoWR (GoO)
V. Progress of On Farm Development (OFD) works	• Action plan by M/s OCC & WAPCOS finalized by 2006 • OFD works undertaken by CADA is programmed to be completed by 2015	• Micro planning of Phase II Ayacut is substantially completed. • WUA and Entry point activities will be entrusted to WALMI • Speedy implementation is anticipated.

D. PRESENT PROPOSAL:

The Government of Odisha in Department of Water Resources has approached Japan International Cooperation Agency (JICA) to provide funding assistance for the concluding phase of Left Bank Canal, subproject LBC−II Phase−II, commencing from RD 71.313 km. to 141.00 km covering an ayacut of 72967 ha CCA.

On the basis of successful completion of the previous phase LBC−II Phase-I the JICA authorities have expressed positive intentions and resumed discussions with the DoWR authorities (GoO) prior to their consideration of loan agreement.

E. STATUS OF STATUTORY CLEARANCES:

I. EIA clearance by State Pollution Control Board (SPCB) Odisha − vide No. 1774/Ind- 1/NOC − 117 /Dated 16.06.1994

II. Environmental Clearance (EC) by Ministry of Environment & Forests (MoEF) Govt. of India vide No. 2011 / 7/96-/IA − I /Dated 04.12.1996.

III. Clearance for whole of the Rengali Irrigation project (RIP) accorded by Ministry of Welfare (Later Ministry of Tribal Affairs, MoTA) Govt. of India vide No.2011/5/96/dated 18.06.1996.

IV. **Stage 1 FC** Obtained from Ministry of Environmental & Forests (MoEF), Govt of India (GoI) vide No. 08/53/96 − FC/21.11.1996 for 2107 ha Forest land.

V. **Stage 2 FC** Obtained from MoEF, GoI vide No. 08/53/96 − FC (Pt.) /dated 14.05.2003 for 812 ha Forest land.

- **Under process:** Clearance for balance 1295 ha Forest land is under active consideration by MoEF.
- **APPLICABILITY:**
  - The above mentioned statutory clearances obtained from regulatory authorities are applicable for the whole of the Rengali Irrigation Project based on Indian context (as Pre-requisites).
  - Such clearances stand valid for LBC-II phase-II subproject.
  - Compliance to conditions are being regularly monitored by the PLEMC setup by the state govt.

VI Techno Economic Clearance accorded by central Water Commission (CWC) Govt. of India vide No. 16/27/96−PA(N)−937−990 dated 24.06.1996

VII Subproject LBC–II (29.177 km to 141.00 km) was cleared by CWC for an estimated cost of 1985.34 Crores INR at BC ratio 1.986.

The entire Rengali Irrigation Project had already received legal environmental and forest clearance based on Indian Law. These clearances are still valid for LBC II Phase II of RIP. In order to monitor the compliance with conditions, the Project Level Environmental Management Committee for RIP was established and it has been working regularly.

F. JICA'S REQUIREMENT FOR APPRAISAL OF SUBPROJECT LBC-II PHASE-II:

- JICA in their Aide memoire Dt. 12th July 2013 desired to revalidate EIA study according to JICA's own guide lines with due reference to world Bank operational policy, even though statutory Environmental Clearance from the Ministry (MoEF Govt. of India) have already been accorded for whole of the Rengali Irrigation project vide Communication dated 4th Dec. 1996.

G. DEVELOPMENT SO FAR

- According to the Aide Memoire: The Inception report for EIA study prepared by OCCL (GoO undertaking) and CEMC [An Environmental consultant organisation] has been discussed in the meeting held on 8th Sept 2013, participated by experts / preparers and DoWR & JICA authorities.

- After holding protracted discussions with DoWR team, the JICA has finally agreed to the ToR prescribed by JICA's team of experts on 7th Oct 2013.

The environmental & social considerations of the project have been studied by consultants appointed by DoWR and draft reports have been examined by JICA's experts at various stages of documentation. This final EIA report basically addresses almost all environmental issues of the study area, concerning impacts, mitigation measures, management plans and monitoring methodology along with the DoWR's support system and budgetary back up. The R&R and socio-economic aspects are studied separately by one of the reputed institutions of the state. Findings of the said study have been considered and incorporated in this report to fulfill JICA's in-principle requirement related to project appraisal and funding decision.

The documented summary of this EIA report is furnished in the following paragraphs.

1. Salient Features of Subproject LBC-II Phase-II:

- Length of main canal LBC-II Phase-II
  (From RD 71.313 km to 141.00 km) 69.687 km

- Branch canals 5 No.s
  Length 732.001 km Ayacut 51216.67
- Distributaries of main canal
  5 no.s of distributaries off taking from main canal
  Length 108.947 km Ayacut 7694.58 ha
- Minors & sub-minors off taking from main canal
  16 no.s of minors & sub-minors
  Length 41.295 km Ayacut 3159.439 ha
- Lift canal provision 3 no.s (presently assessed)
  Ayacut 6412.20 ha
- Direct outlets Ayacut 4484.31 ha

- Ayacut coverage
  Flow irrigation 66,555 ha
  Lift irrigation 6,412 ha
  Total Ayacut 72,967 ha

- Estimated cost (Yr 2014) = Rs.283114.991 Million INR (Out of total project cost from 29.177 km to 141 km being Rs. 39.5556.419 Million INR) as estimated by DoWR (GoO). This is presently under check by CWC (GOI).

- Stipulated implementation period: from 2013-14 to 2023-24 (considering all soft components).

- Project Benefit-
  - No. of Districts to be benefited 3 No.s (Part) (Dhenkanal, Jajpur, Keonjhar districts of Odisha).
  - No. of Blocks to be benefited

Dhenkanal district	2 Blocks	Ayacut - 10356 ha
Jajpur district	4 Blocks	Ayacut - 46600 ha
Keonjhar district	2 Blocks	Ayacut - 16011 ha
Total	**3 Districts**	**8 Blocks** **Ayacut – 72967 ha**

  - No. of villages to be benefited 570 No.s
  - No. of families to be benefited 45,604 No.s
- Funding Agency: Japan International Co-operation Agency (JICA) Japan.
- Budgetary support: Department of Water Resources (DoWR) Govt. of Odisha.
- However part construction works already undertaken by state's own funding for the main canal portion only
  (Reach 1 From RD 71.313 km to 100.49 km) 29.177 km.

- Balance work related to the distribution system are included in Reach 2 is proposed for JICA funding.

2. Objective of the Present Study:

The objective of the study is to prepare an appraisal document comprising of Environment & Social Impacts assessment plans as per the regulatory requirement of the funding agency 'JICA'. During the screening process, JICA has identified the project LBC–II Phase–II under 'Category-A' and determined the Criteria for study. The study also gives due importance & compliance to the requirements of Environmental Legislation of Govt. of India.

Some of those study criteria include;

- Collection of environmental and social baseline information to identify and assess potential impacts caused due to the project implementation on existing natural environment.

- Prepare the Environmental Management Plan(EMP) and monitoring plan against potential environment and social impacts including proposed mitigation measures.

3. Terms of Reference (ToR) for the study:

JICA's team of experts have charted out "Terms of Reference (ToR)" on 7th Oct. 2013 for carrying out the Environmental & Social impact assessment study. (Copy furnished in Annexure No. VI of this EIA document).

4. Study conducted with ToR compliance: The EIA study report includes eleven chapters to describe various environmental and social consideration of the study area to cover the TOR requirement of JICA. The Chaptered contents are

Chapter 1: Introduction
Chapter 2: Project Description
Chapter 3: Environmental Baseline Data including Social Survey results
Chapter 4: Environmental Scoping of EIA Items
Chapter 5: Environmental Impact Assessment & Mitigation Measures
Chapter 6: Analysis of Alternatives
Chapter 7: Environmental Management Plan
Chapter 8: Environmental Monitoring Programme
Chapter 9: Environmental Cost and Analysis
Chapter 10: Public/Stake Holder Consultation Meetings

5. Summary of the Study Report

5.1 Baseline Assessment:

Collection of two seasons baseline data was recommended in the Terms of Reference (ToR). But due to the time constraint, baseline data collection was restricted to one season (Post Monsoon) field survey of relevant Environmental components. However, water samples could be taken during 28th& 29th September 2013, which pertains to the Monsoon season data. Post Monsoon field survey, sampling and data collection resumed from 2nd week of October and continued till November 2013.

5.2 Project Description:

The general information, Technical data, activities undertaken in previous phase (i.e. LBC-II Phase-I), funding strategy & budgets are in conformity with project records of DoWR. These are featured in Chapter 1 & Chapter 2 of this EIA document.

5.3 Baseline Data:

The baseline assessment broadly included survey of the study area, primary data collection, secondary data and literature consultation as well as collection of information / data from the locality involving public and social organisations (SHGs & NGOs). Remote sensing methods have been used wherever necessary.

In the process, area of study included:

- Identification of pollution parameters related to **Environmental Pollution,** covered under land environment, Air and water environment, Noise and vibration effect on sensitive receptors and soil environment etc. The findings of field survey and laboratory test results are furnished in Chapter 3 of this document.
- Description of **Natural Environment** includes study of Forest areas; vegetation and land use; observed / recorded species of flora and fauna with specific reference to Elephant paths. Such details are furnished in 3.10 of Chapter 3.
- Social Environment study has been undertaken by using secondary data followed by obtaining site information. A separate sample Socio-Economic Assessment was conducted through XIMB and the findings of the report have been incorporated in this document. Social study details are furnished in section 3.11 of Chapter 3 and Annexure-X.

5.4 SCOPING OF EIA ITEMS:

Scoping of EIA items has been identified by using various matrices prescribed by environmental guidelines. Such details are documented in Chapter 4 of this EIA report.

5.5 ENVIRONMENTAL IMPACT ASSESSMENT & MITIGATION MEASURES:

The irrigation project will have positive & negative impacts on physical, biological & socio-economic environment of the area in several ways. Whereas, water environment, land use / land cover would be generally impacted during the operation phase. There will be no impact on air and noise environment in the operation phase. The ecology & biodiversity of the area will be affected for which adequate conservation measures would be taken. The socio-economic condition of people would improve due to increase in agricultural activities, communication system etc. The impact on environment during construction & operation phases of the project has been assessed. While some of the mitigation measures have been taken care of in the planning & design stage other measures have been charted out for construction & operation phases. Environmental Impact study has been carried out for both construction phase and operation phase of the project cycle. Environmental Impact items confirm to the JICA's TOR requirements. It includes the following items for both phases.

Environmental pollution control study:

Includes

- Air pollution
- Water pollution
- Sediment quality
- Groundwater levels
- Soil pollution
- Noise & Vibration impact
- Pollution due to waste disposal methods

Anticipated disaster and mitigation measures are suggested for each pollution impact. The above details are furnished in Chapter 5—para 5.1.1.2, 5.1.2.1, 5.1.3.1, 5.1.3.2, 5.1.3.3, 5.1.3.4, 5.1.3.5 etc.

Impact on Natural Environment:

Includes

- Topography and geological features

- Hydrological sufficiency
- Flora, Fauna and Bio-diversity
- Landscape and impact on landscape
- Global warming due to emission impact

Impact on Social Environment

Includes:

- Involuntary Resettlement and Social impact due to land acquisition for the project
- Demographic profile of the affected villagers showing livelihood, social economy, Social infrastructure and services, Historical and Cultural heritage, occupational health, Employment status etc.
- Likely areas of accidents and safety measures
  Such details are furnished in chapter-5 para 5.4 of this EIA document.

The Impact Assessment study undertaken by the local consultants has been discussed with the JICA's team of experts at the Draft stage and draft final stages during the documentation period.

5.6 ANALYSIS OF ALTERNATIVES:

- Feasible and cost effective mitigation measures have been suggested for each anticipated negative impacts likely to appear in both construction and operation phases of the project cycle. These are mentioned concurrently with the impact evaluation.
- Impact and mitigation measures considered with time, duration, and cost effectiveness etc have been charted out which form as environmental alternatives.
- The project has only one development alternative as detailed in previous paragraph i.e. LBC II Phase-II.
- The best alternative amongst the above exercises was suggested, in Chapter 6.

5.7 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Based on the identified mitigation measures, the Environmental and Social Management Plan (ESMP) has been prepared. The Environmental Management Plan (EMP) covers management of various environmental issues such as,

- Command area management plan.
- Management plan against crossing of Natural Streams & Nalla.
- Management plan against water logging and soil salinity.
- Soil fertility Nutrient management plan.
- Management plan against aquatic weed infestation.

- Management plan for health delivery.
- Water quality management.
- Construction management.
- Communication management.
- Fertiliser management.
- Management plan for preservation of Archaeological & Historical monuments.
- Management plan of Wildlife

The management plans are prepared considering the negative impacts assessed both for construction and operation phases of the project cycle. Appropriate mitigation measures are suggested wherever necessary.

Cost involved for implementing the management plan has been identified wherever possible. Some of those management costs are either worked out on prevailing schedule of rates or estimated on rational basis. These expenditures constitute a part of the budgetary provision earmarked under X-Ecology & Environment subhead and some other subheads of the project cost estimate.

The implementation strategy for the proposed EMP includes.

- Involvement of Project Management Unit (PMU) [Administrative structure of DoWR furnished in Pg. No. C4-10.
- Amongst other Responsible organisations involved are line departments of Govt. of Odisha comprising of
    - Forest and Environment Department
    - Agriculture & Food production Department
    - Revenue and Drought Mitigation Department
    - Health and Family Welfare Department
    - CADA and WALMI organisations & under DoWR

5.8 ENVIRONMENTAL MONITORING PLAN

Review and Monitoring of all Management activities form the basic criteria for success of the Environmental Management Plan.

- The consultants have broadly identified the areas where monitoring activities should be organised with mention of frequency, period and involvement of experts for each.
- The environmental monitoring cost has been apportioned at 12 million INR which may vary during the actual monitoring period depending upon subsequent evaluation.

- A format developed by JICA's expert team for Environmental and social management plan (ESMP) and Environmental and Social Monitoring Plan (ESMoP) considering all documented activities during both project construction and Monitoring phases has been prepared by the consultants and later agreed by the JICA's expert team. This format is furnished in Annexure-X of this EIA document, which would provide the instant review of summarized aspects under Environmental Management Plan and Environmental Monitoring Plan.

5.9 Stakeholders' Meetings (SHM)

The project authorities have organized public consultations through 132 village committee (Gram Sabha) meetings to obtain comments and suggestions from the public regarding various Environmental issues of the project. Amongst many development aspects discussed in the agenda, consent for forest diversion proposal for Rengali Irrigation Project is one, which received priority consideration.

SHM were conducted by DoWR at 22 locations During Nov'13 to March'14 cooperated by consultants, representatives of line units and JICA's expert team. The people present were explained about the environmental impact, mitigation measures and other aspects involved with the project implementation. Opinion & comments expressed by the public (most of them being stakeholders) were recorded. On the spot compliance were given by DoWR authorities, Revenue representatives and the consultants.

Further 32 nos of SHM are programmed by April 2014 to be held at various locations inside the ayacut.

Such details occupy Chapter 10 of this EIA document.

5.10 PROJECT COST AND BUDGET

The cost estimate of the project "Left Bank Canal from RD 29.177 KM to 141.00 KM" has been revised during 2014 by DoWR and is under check by CWC (Govt. of India). According to the revision;

- The total cost of LBC-II-Phase-I i.e. 29.177 KM to 71.313 KM which is almost completed through JICA funding works out to be Rs. 11344.14 million; whereas
- Cost of the proposed phase i.e. LBC-II phase-II (71.313 KM to 141 KM) presently appraised for JICA funding works out to be 28211.49 Million INR

- The total project cost under JICA funding LBC-II (From RD 29.177 KM to 141.00 KM) thus works out to be Rs. 39555.64 Million INR
- Phasing of Expenditure has also been proposed which is likely to continue up to 2023-24.
- The amount of funding and funding norms etc by JICA is likely to be decided very soon after consultation with DEA (GoI) and DoWR (Govt. of Odisha).

Environmental Cost:

It is logical that the expenses involved in appraisal of environmental quality and in the preparation of management and monitoring plans should be met from the funds allocated in the project cost estimate.

- The cost for management items which are amenable to estimating are analysed where as for some other items it is worked out on rationale considering identical projects.
- The projected expenditure for amelioration of environment thus works out to be Rs. 1695.13 Million INR @ 6% of the total estimated cost of LBC-II Phase-II works.
- The above environmental cost is not separately budgeted. It is taken as part of the budgetary provision existing under various subheads of the project cost estimate.

6.0 EPILOGUE:

The most important objective of this irrigation project is to enhance crop production in these three agrarian districts namely Dhenkanal, Jajpur and Keonjhar by striking a balance between Environment and Agricultural sustainability.

- After shifting from monsoon driven agriculture to the reliable irrigated agriculture technology the farmer community of the region are aspirant **to attain food security** by adopting a newly recommended cropping pattern which would deliver an estimated 464.6 thousand tonnes of additional food grains leading to an enhancement of income by Rs. 9787 million annually as farm receipts.
- Increasing farm yields will not only lead to attainment of food security and economic stability but also to empower the people with educational economic health and higher social uoliftments.
- Due to implementation of Agricultural intensification programme, large scale employment opportunities will be created in the command area villages based on works of durable utility to the community with use of surplus food grains.

- The state government stresses on dissemination of knowledge to the farmers for proper use of agricultural technology, use of modern agro-implements and scientific application of fertilizer and pesticides.
- In summarizing other benefits anticipated due to the project the significant areas are:
    - **Road Communication**: There would be 70 km long new canal bank road on the left bank canal connecting many villages of Dhenkanal, Jajpur and Keonjhar districts. Similarly road communication will enormously improve due to Branch Canals and distributaries measuring about 840 kms. About 570 villages will be benefitted in the ayacut by availing new road facilities.
    - **Plantation**: Canal Bank plantation is proposed on both flanks of the main canal from RD 71.313 km to 141.00 km. As against felling of about 920 trees, the project authorities have proposed to plant 50,400 trees alongside the main canal. Canal bank plantation alongside of branch canal and distributaries can be taken up in due course.

      Further to the above, it is proposed to take up avenue plantation on the road sides of 9 km approach road. Added to the above environmental upgradation, Greenbelt plantation will be under taken around the proposed staff colony. The sum total of 68,650 trees is to be planted as environmental up-gradation measures.

    - **Health delivery**: Malaria disease being endemic in the region, the project authority focuses on Malaria Mitigation Measures with the help of Health Department. Improved health facilities will also be available to combat epidemic and other endemic diseases in the command area, through various health delivery programmes already funded by the state and the Health Ministry of India.

Despite all these projected benefits, there may be some negative impacts likely to be experienced in the **construction phase**. Of these, some significant environmental issues dealt with are noise and vibration, pollution of Air & Water quality and unscrupulous waste disposals. The project authorities will undertake appropriate mitigation measures to minimize such negative impacts.

Similarly, some negative impacts like water logging, weed formation, soil erosion and loss of soil nutrients as well as water pollution are likely to appear during the **operation phase**. The project authority will ensure implementation of command area and water management plan (CAD & WM) and are committed to implement other mitigation measures as identified in this document.

The project authorities have also emphasized Restoration of existing elephant transit zones appearing in the canal alignment. It is proposed that the Principal

Chief Conservation of Forests & Chief WildLife Warden of the state should be consulted for habitat improvement & other conservation measures for mega herbivores to avoid crop raiding and probable man-elephant conflict. The mitigation measures like Solar fencing, Elephant friendly ramps and few crossovers etc. which are suggested by the survey would be reviewed by the Forest & Wildlife authorities of the state.

However, DoWR stand committed to implement all environmental up- gradation activities, mitigation measures and management plan concurrent with the development activities through its administrative setup. All project management and monitoring activities will be undertaken by the Project Management Unit (PMU), whereas all critical issues are to be biannually reviewed by the Project Level Environment Management committee (PLEMC) and annually by State Level Management Committee headed by the Chief Secretary of the state.

7.0 CONCLUSION:

Last but not the least, the state Government would ensure environmental friendly sustainable development by encouraging active **participation of various stakeholders** comprising of the farming community, socially vulnerable groups, social organization as well as elected representatives to define steps to resolve issues and conflicts to maximize the project benefits and improve the quality of life.

CHAPTER-1
INTRODUCTION

1.0 INTRODUCTION:

Odisha, primarily an agrarian state continued to depend largely on monsoon for its water resources till "mid twentieth century" when in 1962, the state government set up irrigation and power department to plan against spatial variation of monsoon rainfall and ensure rational utilization of its surface and ground water resources.

After the successful implementation of Hirakud dam project on river Mahanadi the state government in early seventies took another giant step to construct the second largest dam project on river Brahmani namely the Rengali multipurpose project with three major components of water resources development i.e. flood control, power generation and irrigation.

1.1 BACKGROUND OF RENGALI IRRIGATION PROJECT:

Rengali multipurpose project contemplated in the year 1971-72 across river Brahmani near village Rengali in undivided Dhenkanal district (presently in Angul District) comprised of three key components achievable in two stages of development.

Stage-1: Rengali Dam Project:

- Envisages construction of 71m high Concrete/Masonry dam with power house structure and ancillaries across river Brahmani at Rengali.

  Purpose I **:** To provide flood relief in the Brahmani Delta areas.

  Purpose II **:** To generate 250 MW Hydro-Power through 5nos units each 50 MW capacity.

Stage 2: Rengali Irrigation Project:

- Envisages construction of a Barrage structure, across river Brahmani near village Samal, 35 km downstream of Rengali dam. The Barrage is to pick up water from the power house release as well as to receive runoff from free catchment appearing in between Rengali Dam and Samal Barrage.

  Purpose III : The Barrage pond is designed to provide Irrigation to **2,18,392 ha** of CCA through two canal systems namely **Left Bank Canal (LBC)** for **1,14,300 ha** and **Right Bank Canal (RBC)** for **1,04,092 ha**.

1.1.1 General Features of Rengali Multipurpose project:

[A] Rengali Dam and Power House:

- Construction of Headworks for Rengali Dam and Power House commenced during 1972-73 and was completed by 1985.
- It comprises construction of 71 m high & about 1 km long concrete and masonry dam structure across river Brahmani at Rengali.
- The surface power house comprises of 5nos power generating units, each with installed capacity of 50 MW. The total installed capacity is 250 MW.
- The first unit was commissioned during 1985 while all other units were commissioned by 1992.
- The cost estimated after completion of Dam & Power House was 2,032 Million INR.
- The release from the Power House flows down the river only to be picked up at Samal Barrage Structure from where utilization of the pondage was planned for providing irrigation to 2,18,392 ha of CCA covering 5 no.s districts of Odisha.
- Since completion, the Rengali Dam is effectively controlling the flood in Brahmani Delta covering an area of 2600 sq.km. as well as supplementing the ever increasing power need of Odisha

[B] Barrage at Samal: [Head Works]

Construction of Samal Barrage commenced during 1978. The Structure and appurtenant works including gates and hoists etc. were completed by 1994. The Salient Features of the Barrage are briefed below.

- Total catchment intercepted at the barrage site is 30,030 sq.kms. It is designed for a 100 years return flood of 24632 cumsec. The observed maximum flood 30000 cumsec.
- The Barrage structure comprises of 560.50 m long concrete structure having 17 no.s of Bays each provided with 20.0 m X 10.2 m Radical Crest gates.
- It has 7 no.s of under sluices each of size 20.0 m X 10.2 m; 4 no.s being located at the left flank and 3 no.s located on the right flank.
- One silt excluder is also provided on the body of the structure.
- The maximum water level of the pond has been fixed at EL 79.50m, whereas the full pond level to be maintained at EL 76.20m. The minimum pond level is 75.50m.
- The live storage capacity is 20.10 Million cubic meter (Mm^3).
- The water spread area at 76.20m is 2880 ha.

- The top elevation at the barrage road is 83.0m (+).
- Two head regulators on either side of the barrage have been constructed for supply of water in Left Bank Canal **(LBC**) and Right Bank Canal (**RBC**) to cater irrigation coverage for 2,18,392 ha of CCA.
- The designed head discharge of RBC is 111.30 cumsec and that of the LBC is 151.864 Cumsec

[C] Canal System: (Main Canals)

- Irrigation water supply was contemplated through two main canals at both flanks of the barrage i.e. **LBC** and **RBC**, each having its planned distribution network. The Salient features of these canals are briefed below in **Table No. C1-1.**

Table No. C1-1: Salient features of Main Canals

Canal	Length	Head Discharge	Bed width at Head	F.S.L at Head	F.S.D at Head	Ayacut (CCA) in ha.	Districts to be benefited
RBC	95 km	111.30 Cumsec	12.00 m	75.50 m	4.28 m	1,04,092	Angul, Dhenkanal, Cuttack & Jajpur
LBC	141 km	151.864 Cumsec	21.45 m	75.50 m	4.30 m	1,14,300	Dhenkanal, Jajpur, Keonjhar

- Salient Features of RIP are detailed in CHAPTER – 2.
- The distribution network of each of the canals LBC & RBC comprise of Branch Canals, Distributaries, Minors and Sub-minors according to the ayacut planning. In the present context, the distribution systems of LBC only; being relevant of the study, is described in CHAPTER – 2

1.1.2 Statutory Approvals and Clearance Obtained:

The works for the above two canals, subprojects of Rengali Irrigation Project, have been started after 1996 through funding assistance from internal and external funding agencies, only after obtaining statutory approvals for each. Such details are briefed below.

A. ENVIORNMENTAL CLEARANCE FOR RENGALI IRRIGATION PROJECT (LBC & RBC):

I. EIA clearance by State Pollution Control Board (SPCB) Odisha – vide No. 1774/Ind-1/NOC–117 /Dated 16.06.1994.

II. Environmental Clearance (EC) by Ministry of Environment & Forests (MoEF) Govt. of India vide No. 2011/7/96-/IA–I /Dated 04.12.1996. [Copy furnished in **Annexure No**. **I**]

B. WELFARE [SOCIO - ECONOMIC] CLEARANCE:

I. Clearance for whole of the Rengali Irrigation Project (RIP) accorded by Ministry of Welfare (Later Ministry of Tribal Affairs, MoTA) Govt. of India vide No.2011/5/96/ dated 18.06.1996. [Copy furnished in **Annexure No**. **II**]

C. FOREST CLEARANCE (FC):

I. **Stage 1 FC:** Obtained from Ministry of Environmental & Forests (MoEF), Govt of India (GoI) vide No. 08/53/96 – FC/21.11.1996 for 2107 ha Forest land. [Copy furnished in **Annexure No**. **III**]

II. **Stage 2 FC:** Obtained from MoEF, GoI vide No. 08/53/96 – FC (Pt.) /dated 14.05.2003 for 812 ha Forest land. [Copy furnished in **Annexure No. IV**]

Under process: Clearance for balance 1295 ha Forest land is under active consideration by MoEF.

D. TECHNO ECONOMIC CLEARANCE:

- Clearance accorded by central Water Commission(CWC) Govt. of India vide No. 16/27/96 – PA(N) – 937 – 990 dated 24.06.1996
- Subproject LBC–II (29.177 km to 141.00 km) was cleared by CWC for an estimated cost of 1985.34 Crores INR at BC ratio 1.986. [Copy furnished in **Annexure No**. **V**]

E. INVESTMENT CLEARENCE (IC):

- Investment clearance for whole of the Rengali Irrigation project was accorded by the Planning Commission, GoI vide No. 11-2(64)/78- A & CAD dated 31.03.1978 for 2336.4 Million INR.
- For LBC-II, Investment clearance was accorded by Planning Commission, Govt of India for 7051.5 Million INR vide No. 2(64)/94–I & CAD /

Dated14.07.1997 and later vide No 2(64)/2008−WR/ Dated14.09.2010 for the revised cost 19583.4 million INR, with BC Ratio of 1.986.

F. ADMINISTRATIVE APPROVAL (AA):

- Administrative Approval (AA) from the State Government was accorded in phases as follows.
- AA to Samal barrage & Left canal system for Rs.1640 million vide erstwhile I&P Dept No. RL−32 /79 /25915 / Dt. 24.07.1979.
- AA to right canal system for Rs. 696.4 Million vide I&P Dept No. RL−348 /23281 /dated 05.08.1981.

G. APPLICABILITY:

- The above mentioned statutory clearances obtained from regulatory authorities are applicable for the whole of the Rengali Irrigation Project based on Indian context (as Pre-requisites).
- Such clearances stand valid for LBC-II phase-II subproject.
- Compliance to conditions is being regularly monitored by the PLEMC setup by the state govt.

1.1.3 Phasing of Canal Construction:

Table No. C1-2: Implementation Status Right Bank Canal (RBC)

Sub Project	Length/Reach	Ayacut in ha	Implementation Status
RBC I	00 km to 79 km	32,576	Works ongoing through AIBP (GoI) funding
RBC II	79 km to 95 km	71,516	-do-
Total		**1,04,092**	

Table No.C1-3: Implementation Status Left Bank Canal (LBC) System

Sl. No	Sub Project (SP)/ Phase No	Length/Reach in kms	Ayacut /CCA in (ha)	Implementation Status
1	SP 1- LBC-I (Flow)	00 km to 29.177 km	8,483	Completed-[Presently operative] through world Bank funding
2	SP-II LBC-II Phase-I (Flow)	29.177 km to 71.313 km	26,946	-Substantially completed through JBIC /JICA funding. [Presently operative]
3	SP-II LBC-II Phase-II (Flow)	71.313 km to 141 km	66,555	-Sub Project proposed for JICA funding Assistance -Work initially commenced by State Govt. funding.
4	Lift Subproject in various Reaches	LBC-I Phase-I	3,674	Completed
		LBC-II Phase-I	2,230	-On going − partially completed for 760 ha
		LBC-II Phase-II	6,412	Proposed under JICA funding
Total		**1,14,300 ha**		

1.1.4 Status of Implementation

- **Right Bank Canal [RBC]**
  - The head discharge of RBC is 111.30 m^3/sec
  - Total length of canal is 95 km, split in to two phases of implementation i.e. RBC-I & RBC-II subprojects.
  - Total ayacut is 1,04,092 ha of which 84406 ha coverage from flow source & 19,686 ha from Lift.
  - Execution of both the above subprojects is undertaken by AIBP funding (Govt. of India).
  - The construction activities are ongoing.
- **Left Bank Canal[LBC]**
  - Head discharge is 151.864 m^3/sec.
  - Total length of LBC is 141.00 km.
  - Ayacut coverage is 1,14,300 ha of which ayacut coverage from flow source is 1,01,984 ha and 12316 ha through Lift.
  - The implementation is undertaken in two sub projects LBC-I and LBC-II. The 2nd sub project LBC-II is further split into 2 phases namely LBC-II Phase-I and LBC-II Phase-II.
    - **LBC-I [00-29.177 km]**
      - Includes construction of Main Canal, up to 29.177 km Parjang branch canal; Distributaries, Minors & Sub-minors.
      - The works completed through World Bank Funding under WRCP (Scheme Completion).
      - Irrigation Potential created is 8483 ha (Flow) + 3674 ha (Lift)
      - The World Bank loan has been closed by September, 2004.
    - **LBC-II Phase-I [29.177 km to 71.313 km]**
      - Construction of 42.136 km Main Canal along with its distribution system has been undertaken through external funding agency [JBIC] later taken over by JICA.
      - Funding made available through 3 Tranches, of which the Tranche-III is effective up to **24th Nov 2015**.
      - According to the target date (June 2012) all civil works have been substantially completed.
      - Irrigation Potential created is 26,946 ha (Flow) + 2230 ha (Lift).
    - **LBC-II Phase-II [71.313 km to 141.00 km]**
      - The survey, investigation works have been completed & Land Acquisition process in progress through State Govt. funding.
      - The work under this phase is a **New Proposal** for external funding.

Location map showing the above project features is furnished in **Fig.No.C1-1.**

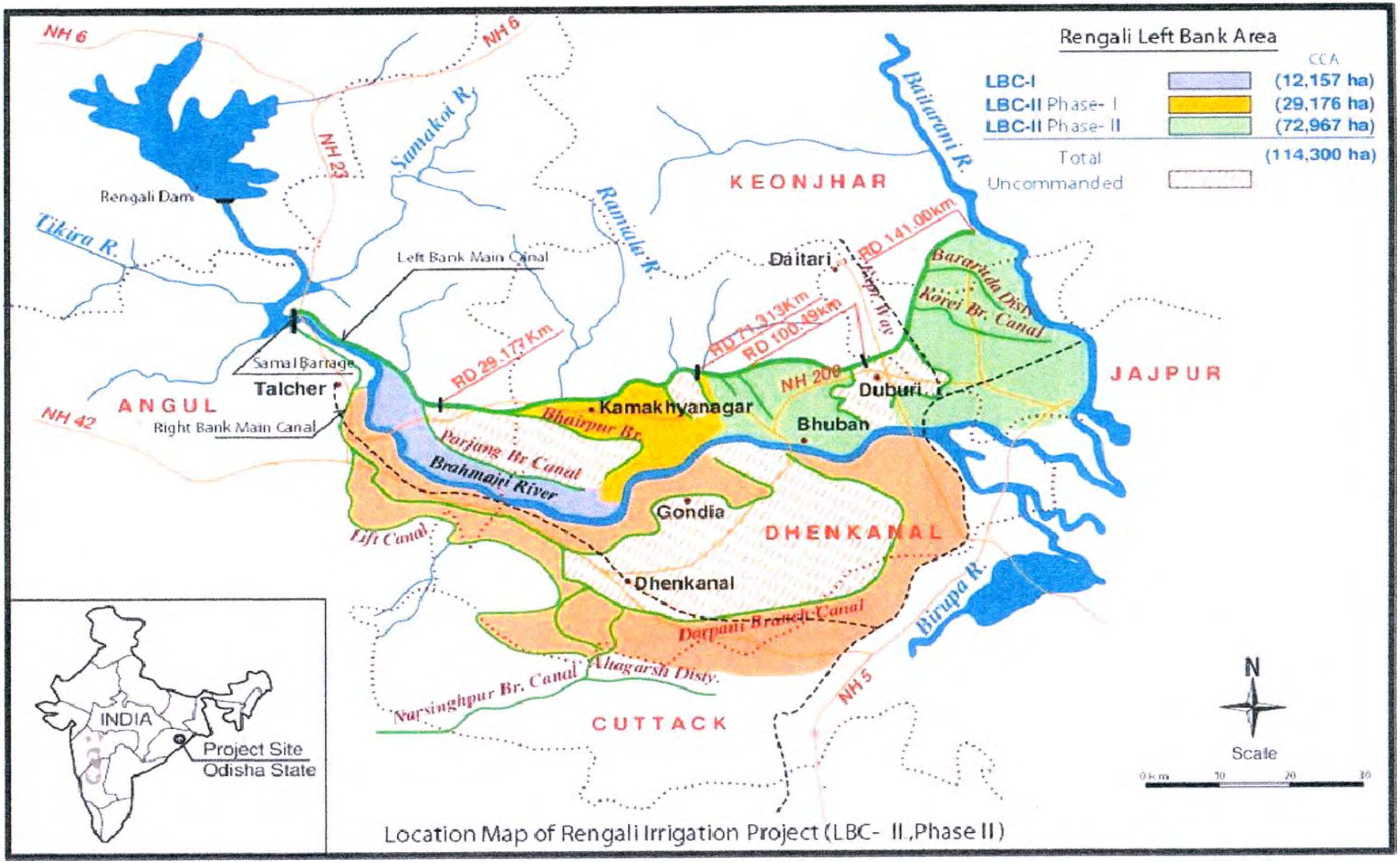


Fig.No.C1-1: Location map of RIP

1.1.5 The New Proposal for Funding Appraisal:

- **Ayacut Coverage** : Flow Irrigation under LBC-II Phase-II = 66,555 ha
  Lift Irrigation LBC-II Phase-II = 6,412 ha
  Total =**72,967 ha**
- **Estimated funds requirement** **:** 28211.50 Million INR out of Total LBC cost Rs. 39555.64 Million (As per Cost Estimate 2014)
- **Stipulated implementation period** **:** 2023-24(10 years after funding)
- **Project benefit** **:** Villages to be benefited =621
  : Families to be benefited =45,604
- **Funding Agency: Japan International Cooperation Agency [JICA]**
  : South Asia Department, JAPAN
- **Funding Criteria**:
  - Funding Strategy of JICA – The EIA and socio-economic study are being undertaken as per JICA guidelines. These reports are pre-requisite consideration of loan agreement between JICA & DEA (Govt. of India)/DOWR (Govt. of Odisha).
  - Study and preparation of the above reports are being carried out by DOWR (Govt. of Odisha)/ Project Authorities.
  - Rengali Irrigation project along with scheme details of completed phases as well as the new proposal are shown in the schematic presentation **Fig.No.C1-2.**

1.2 OBJECTIVE OF THE PRESENT STUDY:

The objective of the study is to facilitate the Department of water resource (Govt. of Odisha) in the preparation of an appraisal document comprising of Environment & Social Impacts assessment plans as per the regulatory requirement of the funding agency 'JICA'. As per the screening category, the JICA has identified the project LBC–II Phase–II under 'Category-A' and determined the Criteria for study.

Some of those study criteria include;

- Collection of environmental and social baseline information to identify and assess potential impacts on existing natural environment.
- Assess likely pollution impacts which may be caused due to the project implementation.
- Prepare the Environmental Management Plan (EMP) and monitoring plan against potential environment and social impacts including proposed mitigation measures.
- The assessment methodology should confirm to the relevant requirement under the environmental legislations in India as well as JICA guidelines for Environmental & Social Considerations, 2010.

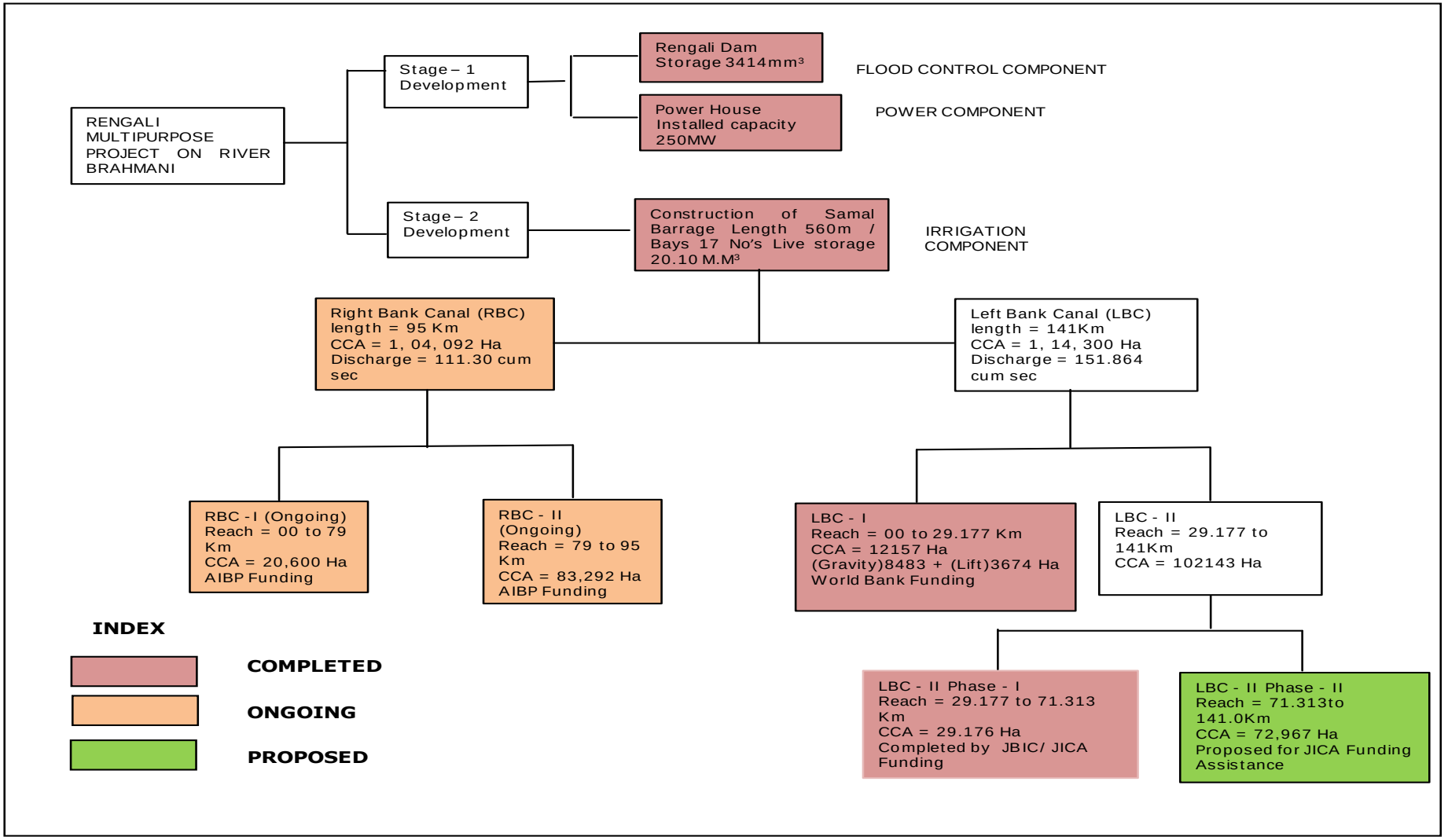


Fig.No.C1-2: Schematic Presentation Showing Development of Rengali Irrigation Project

1.2.1 JICA Requirement:

In its confirmation of Environmental & Social consideration, JICA places importance on dialogue with all involved partners i.e. the host country, state government as borrowers and the project authorities. It also emphasizes transparent and accountable processes as well as active participation of key stakeholders.

Further to the above basic requirements of JICA for its funding strategy, the following items are required as additional ties.

[I] To Update Environmental Impact Assessment (EIA)

In view of the Environmental clearance (EC) already obtained from MoEF (Govt. of India) for the entire project; updation of the EIA report is required. The existing EIA report needs to be revised in line with the current JICA guidelines 2010.

[II] To Prepare Social Impact Assessment Report:

The report would basically contain the Inventory of Socio–Economic status of the study area and analysis of the relevant baseline data / Demographic profile. It would also include social impact due to land acquisition without resettlement.

1.2.2 Study Conducted For The Previous Work:

The Environment and Socio–economic Impacts Assessment study proposed in the present proposal LBC–II Phase–II (71.313 km to 141.0 km), constitute the concluding phase of Rengali Irrigation Left Bank Canal system. Supportive necessity dovetails consultation of various study reports already prepared by the consultants engaged by DoWR for the previously completed phase (i.e. LBC-II Phase–I, 29.177 km to 71.313 km) as lesson learnt exercise for the present study.

Box No. 1: Consulted Study Reports

Sl. No.	Supportive reports	Year	Consultants of DoWR
1	Review report on Environmental aspects of LBC-II Phase - I	April 2000	Nippon Koei (NK-Japan) & WAPCOS (India)
2	Action plan of mitigation measures for conservation and Management of wildlife in project impact area.	Nov 2007 & April 2008	Association of NK, WAPCOS & Wildlife Organisation Govt. of Odisha
3	Action plan for Malaria Mitigation measures in RIP, LBC-II Phase-I under JICA loan Assistance	April 2011	Association of NK, WAPCOS
4	Social study report on Socio – Economic conditions of RIP Subproject LBC-II Phase-I	April 2011	-do-
5	Completion report for consulting services for RIP subproject LBC-II Phase-I	June 2012	-do-
6	Reports / proceeding of project level Environmental committee (PLEMC)	May 2013	-do-

1.2.3 Brief Account of The JICA Assisted RIP–Subproject LBC–II Phase-I (Previous Phase):

The present study entails establishing linkage with the activities & achievements of the previous phase which was funded by JICA.

a) Funding Assistance:

Government of Odisha have availed loan assistance from OECF/JBIC/JICA (Japan) for implementation of Rengali Irrigation subproject LBC–II Phase-I (RD 29.177 km to RD 71.313 km) in three tranches.

Box No. 2: JBIC funding

Tranche - I	ID – P 135	Period 1997 to 2005
Tranche - II	ID – P 154	Period 2004 to 2012
Tranche - III	ID – P 210	Period 2010 to 2015-16

b) Scope of work :

The subproject is substantially completed except for some soft components and one structure i.e. CR cum escape. The completed works involved under the scope are:

Box No. 3: Scope of Work for LBC–II Phase-I

Civil works	Construction of main canal, Branch canal, Distributaries, Minors & Sub minors	LBC – 42.136 km (from 29.177 km to 71.373 km) BBC – 34.78 km 7 no.s Distributaries, 73 no.s Minors & 93 no.s sub minors
Technical Assistance	Entry Point Activities (EPA)	Implementation of Incentive schemes like micro–credit, community asset building & formation of SHGs.
	Strengthening of WALMI	Capacity building of farmers & institutional strengthening of WALMI
	Training	Training of DoWR personnel & NGOs
	On firm development	Technical guidance to farmers and Soil testing facility.
	Malaria mitigation measures	Mitigation of Malaria risks in study area.
Consulting services	Outsourcing through reputed consultants	Overall planning & Design, construction supervision, Guidance and Training.

Source – Completion Report June 2012

c) Brief Achievements :

I. Utilization of financial aid could create additional irrigation potential of 29,176 ha.

II. About 39,588 households are benefited.

III. Increase in Crop yield.

IV. Increase in gross annual income i.e. from Rs 13,348/year (year 2011) per household to Rs 60,039/year (projected) per house hold.

V. Provides enhanced communication facilities through construction of Canal Bank service roads.

VI. Lesson learnt from Entry point activities i.e. formation of WUA, Institutional strengthening of WALMI, OFD works, Agricultural Intensification and Malaria Mitigation measures.

VII. Guidance for Environment Management & Construction plan for Wildlife (Mega Fauna) of the study area.

VIII. Suggestion for Socio-economic status up-gradation through Project Benefit Monitoring and Evaluation (PBME) system.

d) Inputs:

Major inputs have been provided by the team of internationally and nationally reputed consultants /professionals in the following aspects.

- Overall project management
- Planning and design
- Preconstruction and procurement
- Construction supervision
- Operation and maintenance
- Environmental management
- Guidance & training
- Socio–economic Impacts

DoWR intends to utilize the above consultancy inputs in preparation of the study report for LBC–II Phase–II.

1.2.4 Lesson learnt Aspects:

During the construction period of LBC–II Phase–I, diversified issues and challenges were involved which were addressed in a time bound manner although the works under the phase may be termed as "substantially completed" except for some ongoing soft component activities. Study of these constraint areas and advices in arriving solutions for them will set up guidance for the present study.

The constraint areas / Bottlenecks faced are mentioned in **Box No.4.**

Box No. 4: Lesson Learnt Aspects

Sl.	Items	Constraint areas &	Recommendations &

No.		Bottlenecks	Advices
1	Land acquisition	Land acquisition process for acquiring private land consumed much longer period than programmed.	• To expedite Land acquisition process through a body of Land acquisition experts. • Consider Public Private Partnership (PPA) mode through reputed NGOs.
2	Rehabilitation & Compensation packages	Delay experienced for rehabilitation of squatters & projects affected families.	• To strengthen R&R body of DoWR and ensure timely rehabilitation.
3	Availability of Design & Drawing for structures	This factor is a major contributor for execution of works.	• To ensure timely decision and complete the design & drawings.
4	Procurement	Delay in execution of large contract packages.	• To ensure rational framing of contract packages. • Subletting may be permitted.
5	Monitoring mechanism	Decision making is often delayed due to paraphernalia.	• Set up one Project Management Unit (PMU) –Autonomous in stature and to be empowered for instant decision making.

Source: Completion Report 2012

1.2.5 Comparative Situation for The Proposed Study Under LBC–II Phase–II Previous Phase:

From the above lesson learnt exercise the proposed study under LBC–II Phase–II avails certain advantages over the items of impediments considered for works of the previous phase.

Comparative Situations*:*

Items Considered	For Phase I works	For Phase II works

I. Land Acquisition	• In the LA process additional Land were necessary: • Legal problem faced during LA process	LA process is already in advanced stage.
II. Delay in finalization of Design & Drawings	Progress of work delayed due to design finalization of cut & cover portion.	Design & Drawings for major Aqueduct over Damsalla nalla finalized.
III. Forest Clearance	Stage II FC was accorded in 2003 but Tree felling abnormally delayed.	• Stage II FC is in the advance stage. • Joint verification & Public Hearing have almost been completed.
IV. Organizational Setup	Creation of additional establishment was delayed.	Required establishment has already been notified by Govt.
V. Progress of On Farm Development (OFD) works	• Action plan by M/s OCC & WAPCOS finalized by 2006 • OFD works undertaken by CADA is programmed to be completed by 2015	• Micro planning of Phase II Ayacut is substantially completed. • WUA and Entry point activities entrusted to WALMI. • Speedy implementation is anticipated.

1.3 DESCRIPTION OF SCOPE OF STUDY (UNDER ToR) FOR THE SUBPROJECT LBC–II PHASE–II:

The scope of study is summarized as below:

I. Study Area: The study area for environmental survey shall cover items of environmental and social consideration of Rengali Irrigation sub project LBC-II Phase-II; from RD 71.313 km to 141.00 km having ayacut of 72967 ha.

II. Base Line Assessment & Data Collection: Base line survey and two season Data collection shall be carried out in the study area for all relevant

environmental components followed by secondary data support and literature review.

III. **EIA Study**: The EIA study shall include,
- Identification and Assessment of impact.
- Environmental Impact items, Natural environment items (flora, fauna & biodiversity) and social environment shall be considered.

IV. **Analysis of Alternatives & Mitigation Measures**: Under this, feasible and cost effective mitigation measures against negative impacts shall be mentioned with selection of best alternative.

V. **Environmental Management Plan**: Based on the identified mitigation measures, the Environmental and social management plans (ESMP) shall be prepared for both construction phase and operation phases.

VI. **Environmental Monitoring Plan**: Monitoring plan covering 3 to 5 years span of monitoring period shall be charted out considering the relevant areas /units of ESMoP.

VII. **Meetings with the Stake Holders**: Meeting with the stake holders shall be carried out to collect opinion of the public and disseminate information on project. Copy of the draft Terms of Reference (TOR) is furnished in **Annexure No. VI**.

1.4 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK:

Over a period of years, the Government of India has issued various policies and guidelines and has enacted many legislation for development of water resources projects and sustainable environment.

Various policy backups, reinforced with well-developed legal mechanism and administrative framework of the central and state government agencies effectively regulate conservation of resources, ensures protection of the environment and the health & well-being of the people.

Some of those policy provisions and legal instruments which back up the study are mentioned below.

1.4.1 Policy Frame Work:

1. National water policy 1987 – Amended 2002 by Govt. of India.

2. State water policy 1994 – Revised 2007 by Govt. of Odisha.
3. National Environment policy 2006 (Vide Gazette Notification 14th September 2006) and amendment 2010 – By MoEF Govt. of India.
4. National policy for R&R (NPRR) 2003 – Amendment 2007 (vide Gazette Notification 31st October 2007) – By Ministry of Rural Development Govt. of India.
5. Orissa Resettlement & Rehabilitation policy 2006 (Notification May 2006) & Amendment 2007, 2012 and 5th August 2013 - By Govt. of Odisha
6. The right to fair compensation and transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. (No.30 of 2013)

1.4.2 Legal Acts and Legislation:

National level Acts

1. The water (Prevention & Control of Pollution) Act, 1974 – Amended 1988
2. The air (Prevention & Control of Pollution) Act, 1981 – Amended 1987
3. Noise pollution (Regulation & Control) Rules 2000 – Amended 2002 & 2006
4. The Environment (Protection) Acts, 1986 – Amended 1991
5. The Environment (Protection) Rules 1986.
6. Forest (Conservation) Act, 1980 Amended 1988 & 2012.
7. Forest (Conservation) Rules, 2003.
8. Wildlife (Protection) Acts, 1972 – Amended 2002.

State level legal support

1. Orissa Irrigation Act – 1959
2. Orissa Irrigation Rules, 1961 – Amended October 2010
3. Orissa Irrigation Manual, 1887
4. Orissa land acquisition Act, 1894
5. Orissa Pani Panchayat Act & Rule

Guidelines

1. Guidelines for collection of data to study Environment Impact of Water Resources projects – 1984 by CBIP
2. Guidelines for Soil Conservation and watershed Management by Ministry of Agriculture Govt. of India
3. All India Soil & Land Use Survey (AISLUS) guidelines

1.4.3 Administrative Framework:

1. Water Resources Board [WRB] :

Government of Odisha constituted the water Resources Board (WRB) the apex body in water sector, headed by the Chief Secretary of the state as the Chairman. It has ten Departmental Secretaries of the State Government as Members and the Engineer in Chief (WR) as Member Secretary. The WRB is the highest forum to ensure inter-departmental co-ordination; water planning and development; prioritization of water resources development and environment management plan.

2. Department of Water Resources [DoWR]:

The Department of Water Resources (DoWR) is responsible for planning, developing and managing the state's water resources for irrigation, bulk water supply to industries, Flood Control & Drainage along with implementation of all Major, Medium & Minor irrigation projects; their operation and maintenance etc.

3. R & R Directorate:

This important directorate is operative under DoWR, headed by a Director from IFS (Forest Service) discipline to look after the Resettlement & Rehabilitation issues of all water Resources Projects.

4. Command Area Development Authority (CADA):

The Command Area Development Authority (CADA) functions under the Department of water Resources to implement centrally sponsored Command Area Development and Water Management (CAD & WM) programme for major medium Irrigation projects of the State.

5. Technical Support System :

- Engineer in Chief, Water Resources (EIC WR) is the highest technical head functioning under DoWR. He is assisted by six Chief Engineer & Basin Managers along with territorial Chief Engineers of projects and other line unit technical heads as per DoWR organogram.
- Engineer in Chief Planning and Design (EIC, P&D) is assisted by Chief Engineer, Project Planning and Formulation; Chief Engineer (Design & Research).
- Rengali irrigation Project is being looked after by two Chief Engineer & Basin Managers; namely CE & BM Brahmani Left Basin and CE & BM Brahmani Right basin. They are supported by Superintending Engineers and Field Executive Engineers as per DoWR staffing mechanism.

6. Institutional / Organisational Support:

Support available from the following organisations

- State Pollution Control Board, Odisha under Department of Forest & Environment.
- Water and land Management Institute (WALMI) under DoWR.
- Directorate of Ground Water Survey and Investigation.
- Orissa Lift Irrigation Corporation Ltd.
- Orissa Construction Corporation Ltd.
- Orissa State Disaster Management Authority (OSDMA)
- Principal Chief Conservator of Forests
- PCCF(Wildlife) & Chief Wild life Warden

1.5 APPROACH FOR ENVIRONMENTAL STUDY:

1. Necessity for environmental study:

Water resources projects have major contribution towards economic growth inter-alia improvement of the quality of life of the people in the region. But the benefits from these projects may not be sustained over a long period if environmental considerations are ignored.

2. Objective:

The objectives are outlined as:

- Assessment and analysis of the positive and negative environmental impacts.
- Selection of a project alternative which may have substantial positive impacts and limited adverse impacts.
- Preparation of an implementable environmental management plan and monitoring programme to minimize negative impacts and maximize positive ones.
- Provides the basis for decision making.

3. Leading Activities:

The above objectives are achievable through basic activities like

- Conducting environmental reconnaissance of project components – field visits to understand / review problems and problem areas.
- Data collection with field survey – appropriate sampling and testing etc.
- Collection of baseline data – analysis and validation for prediction of impacts.

- Preparation of an implementable management plan and monitoring programme.

4. Approach For EIA Study:

The 'Approach' to study the environment includes the sequence and appropriate steps to proceed with the basic purpose and to ascertain baseline conditions for various environment components; analyse data and predict the impacts.

The general approach for EIA study is presented in **Fig.No.C1-3**

1.6 METHODOLOGY FOR EIA STUDY:

The standard methodology for the data collection, Impact assessment and formulation of management plans is adopted. Statutory Acts, Legislation and laws along with JICA guide lines and world bank safeguard policies were consulted with a view to ensure compliance with various requirements. Environment Impacts are assessed for various phases of projects cycle, namely:

[I] IMPACT DUE TO PROJECT LOCATION:

Study includes:

- Loss of forest land
- Resettlement and rehabilitation
- Encroachment into Natural reserve (Biota)
- Change in land use/ land use conflicts
- Effect of water resources i.e. on hydrological regime, water quality, risks of flooding – conflict amongst water users etc.
- Seismicity
- Impact on historical monuments/ Archaeological sites

[II] IMPACT DUE TO PROJECT DESIGN:

Study includes:

- Impact on water quality
- Risks of water-logging & soil salinity
- Design of hydraulic structures i.e. seepage, siltation, canal crossing etc.
- Communication facilities

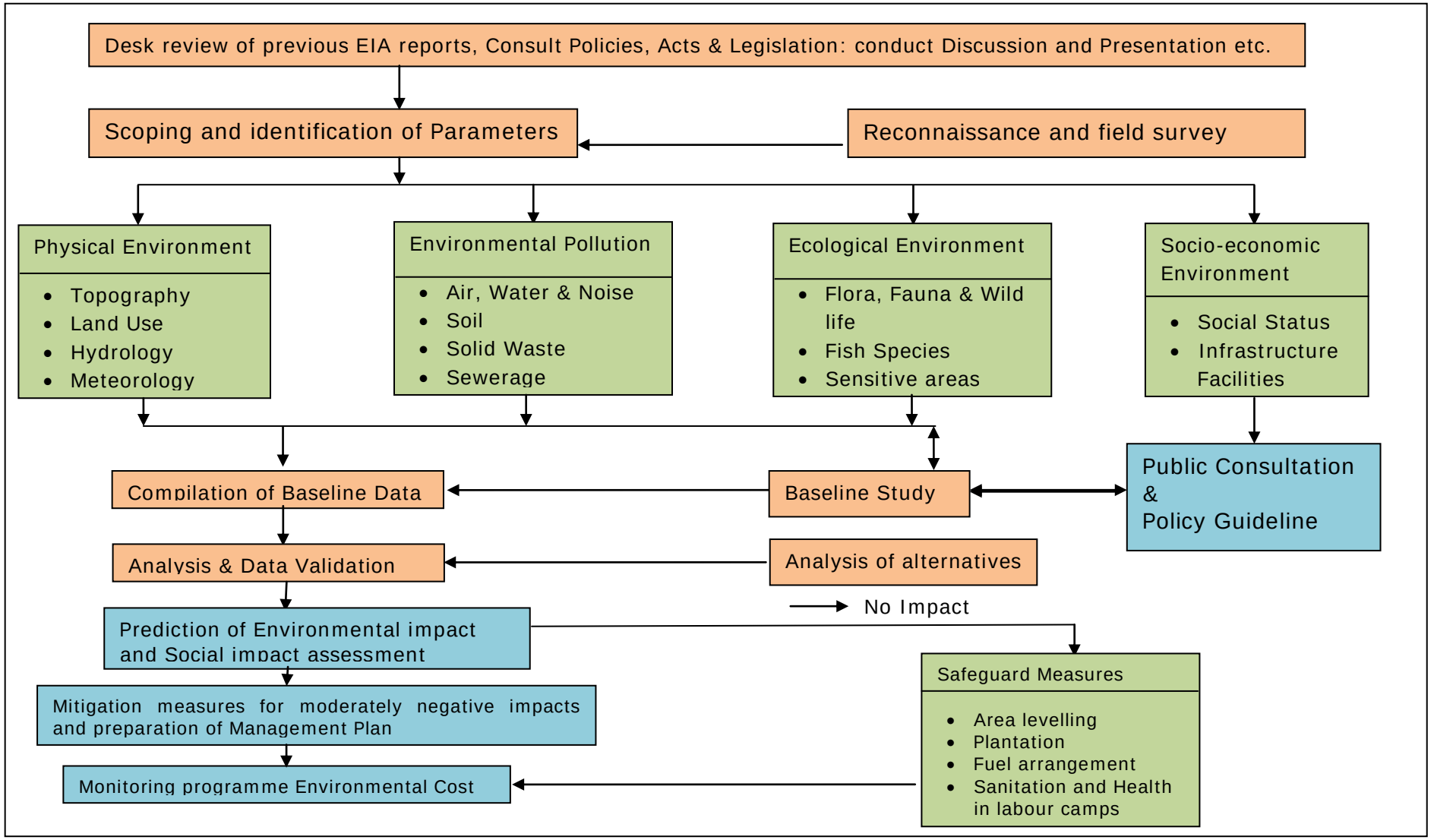


Fig.No.C1-3: Approach for EIA Study

[III] IMPACT DUE TO PROJECT CONSTRUCTION:

Study includes:

- Pollution potential
- Public health – control of Malaria & Water borne disease vectors
- Air and Noise pollution
- Culture and socio – economic conflicts
- Risk management

[IV]IMPACT DUE TO PROJECT OPERATION:

Study includes:

- Impact due to excess use of chemical fertilizers and pesticides
- Growth of aquatic weeds
- Restoration of soil fertility
- Impact on public health
- Benefits

1.6.1 DATA COLLECTION:

- Standard methods of data collection have been adopted for all environmental attributes from primary and secondary sources.
- Baseline data includes project level basic data and field survey data.
- Sampling of water and soil for testing relevant quality parameters (Before project).
- Ambient Air Quality, Noise and Vibration levels (Before Project)
- Secondary data includes recorded data from recognized institutions / organisations /offices, use of standard literatures, study reports from line departments, and consultation of maps.
- Data from local enquiry, consultants own assessment, laboratory test results etc. are used.
- Local NGOs and SHGs have been consulted wherever found necessary.

1.6.2 Data Compilation, Analysis & Validation:

- All environmental baseline data which are collected were formatted, analysed and validated with the standard data.
- Various formats and checklist were used to store data and conduct necessary analytical overview.

1.6.3 Environmental Impact Assessment:

Methodology:

- The objective of the study is to assess the impacts as a result of construction of the canal system LBC−II Phase−II commencing from RD 71.313 km to 141.00 km.
- The impact during construction phase relates to 1 km core area on either side of the canal alignment.
- Both positive and negative impacts for each environmental component have been assessed and evaluated.
- Prediction of impact and forecast of the future environmental conditions in the project has been done by using standard matrix method.
- Superimposition of impacts using the lessons learnt data from previously completed works and impact comparison method is used for some critical components.
- Mitigation measures against some negative impacts in the areas of air, water, soil and ecological environment have been suggested.

Further details are furnished in chapter 4 of this EIA report.

1.6.4 Environmental Management Plan:

Methodology:

- **Objective:** One of the most pervasive and complex challenges faced by any Government is how to provide better living standards through developmental activities consistent with sustained maintenance of good environmental quality. To maintain equitable balance between development benefits and sustainable environment, proper management plans become imperative.

- **Approach:** Environment management plan (EMP) will be prepared against more predominant negative impacts, basically aimed at long term benefits.

- **Management interventions:** EMP reasonably covers key management plans, like Command area management, Ecology [Conservation of Flora Fauna & Wildlife] management, Health management, Water quality pollution management, Water logging & soil salinity management.

- Specific reports from CAD & WM authorities, Forest department, Health department, Agriculture department and other Line departments of DoWR, are to be obtained for enhancing the quality of environmental attributes.

- Results of lesson learnt review from previously completed phase I of the project are also consulted for preparation of EMP.

1.6.5 Environmental Monitoring:

Objective: Monitoring mechanism is an essential component for sustainable water resources development integrated with environment management plan.

Methodology:

- Critical areas of the environmental management plan have been selected for monitoring and evaluation.
- Monitoring mechanism according to the administrative organogram, along with project level responsibilities has been charted out.
- Monitoring period as well as cost effective corrective action proposed by the experts are mentioned. The monitoring period may vary according to DoWR agreeability to review recommendations.
- The details are described in chapter 7 of this EIA report.

1.6.6 Maximising Project Benefits:

- Listing out Environmental Cost and Budgetary provision for Environmental compliance.
- Listing out contemplated project benefits.

1.7 LIAISON WITH AUTHORITIES:

During the preparation of this EIA report, the environmental experts have preferred liaisoning with the project authorities and JICA's experts in order to discuss the scope of the study, and to avail data in the specific areas of environmental attributes, general comments and observations.

1.7.1 Liaisoning with Project Authorities:

The project authorities have been consulted for maps, drawing documents and base line information. Methodology adopted for EIA study of JICA assisted Phase I project (completed portion), completion reports prepared by designated national & international experts and status report of project level Environmental Management Committee have also been consulted. Over and above, the apportioned environmental cost and budgetary allocation has been ratified.

1.7.2 Consultations with Stake Holders:

As per JICA's ToR requirement, a number of meetings with the stake holders for EIA comprising of local people/beneficiaries are proposed to be organized by the project authorities for dissemination of various mitigation measures and management procedures so that their feedback are recorded for taking up appropriate corrective measures.

1.7.3 Consultations with JICA's Expert Team:

Documented content confirmation of EIA and Socio-economic Impact study report was a phased pre-requisite according to JICA.

1.7.3.1 Data Confirmation after Baseline Assessment:

The base line data collected by the environmental experts and analytical results have been communicated and discussion has been held with the JICA's expert team to invite comments and suggestions. Guided field visit with the project authorities and JICA's expert team has been a part of the field study in regard of ecology and mega fauna (elephant) study.

1.7.3.2 Confirmation of Draft EIA Report and comments for compliance by DoWR (Dated 23rd Dec 2013)

1.7.3.3 Confirmation of Draft Final EIA Report and comments for compliance by DoWR (Dated 14th Feb 2014)

1.8 FORMAT OF THE EIA REPORT:

The chapters which most describe the above features of EIA study are as follows;

Chapter 1: Introduction

Chapter 2: Project Description

Brief description of the proposed project/and its salient features.

Chapter 3: Environmental Baseline Data

Collection and compilation of the baseline survey data comprising of Physical, Biological and Socioeconomic details and pre-project status of the Air, water, land & Noise environments.

Chapter 4: Environmental Scoping of EIA Items

Describes screening & scoping of EIA

Chapter 5: Environmental Impact Assessment & Mitigation Measures

Comprises broad assessment of potential negative and positive impacts; evaluation method with appropriate matrix, mitigation measures against pollution parameters and socio-economic status.

Chapter 6: Analysis of Alternatives

Describes Environmental Alternatives & Development Alternatives Considered for LBC.

Chapter 7: Environmental Management Plan

Describes the environmental management strategy against the predicted negative impacts and suggestions to structure the implementation planning.

Chapter 8: Environmental Monitoring Programme

Comprises of the Monitoring programme both during the construction and project operation period.

Chapter 9: Environmental Cost and Analysis

Summarises the cost of environmental management and monitoring activities and highlights the budgetary provision for the project.

Chapter 10: Public/Stake Holder Consultation Meetings

Chapter 11: Disclosure of EIA Report.

CHAPTER - 2
PROJECT DESCRIPTION

2.0 PROJECT BACKGROUND:

Rengali Multipurpose Project across river Brahmani, the second largest major project of Odisha was conceptualized in early seventies of twentieth century by the erstwhile Department of Irrigation & Power, at present the Department of Water Resources in Government of Odisha. The objectives of the project entail:

- Flood control in the deltaic region of river Brahmani.
- Generation of hydropower @250MW installed capacity.
- Provide Irrigation facilities to 2,35,500 ha (CCA) ayacut spread in five of the 30 districts of Odisha to enhance agricultural production and ensure food security.
- The implementation of project was contemplated in two stage development.

Stage 1: Flood Control & Power Generation

Includes construction of Rengali Dam and Power House near village Rengali

Stage 2: Irrigation

Includes construction of a Barrage at Samal, 34 kms downstream of the Dam structure, along with its two canal systems comprising of Left Bank Canal (LBC) and Right Bank Canal (RBC).

Location map of Rengali Irrigation Project is furnished in **Fig.No.C1-1**

2.0.1 Phased Construction Schedule :

Head Works:

- Stage 1 development comprises of construction of Dam and Power House. The civil works commenced during 1973 and was completed during 1985. Generation of 250MW Hydropower in 5 units each of 50MW installed capacity was commissioned in 1992.
- Stage 2 development comprising of head works of Barrage and Head Regulator structures commenced during 1978 was completed during 1994.
- But, construction of two canal systems i.e. LBC for 141 kms & RBC for 95 kms were delayed due to resource constraint of the state.

2.0.2 Phasing Of Canal Construction:

The state Government, in order to expedite creation of new irrigation potential strategically decided to split-up the huge quantum of work into various sub-projects and approached some external and internal funding agencies for availing funding assistance.

Accordingly, the Department of water resources (DoWR) prepared a phase wise construction programme for the LBC and RBC along with their distribution network. Phase wise implementation was posed for funding assistance.

Table No. C2-1: Phasing Schedule with Irrigation Potential

Canal System	Subproject/ Phase	Chainage (km)	Length (km)	Ayacut(ha)			Funding Agency
				flow	Lift	Total	
Left Bank Canal System (LBC)	Subproject – I LBC–I / Phase–I	00– 29.177	29.177	8483	3674	12,157	World Bank (External)
	Subproject – II LBC–II / Phase–1	29.177-71.313	42.136	26946	2230	29,176	JICA/Japan (External)
	Subproject – II LBC–II / Phase–II	71.313 – 141	69.687	66555	6412	72,967	Proposed for JICA funding (External)
(A)	**TOTAL LBC**	**00 to 141**	**141.00**	**1,01,984**	**12,316**	**1,14,300**	
Right Bank Canal (RBC)	Subproject – I RBC–I	00 -79.00	79.00	18,400	2,200	20,600	AIBP/ GoI (Internal)
	Subproject – II RBC–II	79.00 - 95.00 (Reduced form 112)	16.00	66,006	17,486	83,492	AIBP/ GoI (Internal)
(B)	**TOTAL RBC**	**00-95.00**	**95.00**	**84,406**	**19,686**	**1,04,092**	
	TOTAL IRRIGATION		**236**	**1,86,390**	**32,002**	**2,18,392**	

**Source - NK & WAPCOS Report June 2012*

2.1 SALIENT FEATURES OF RENGALI IRRIGATION PROJECT (R.I.P):

A. SALIENT FEATURES OF SAMAL BARRAGE

1. Location	: Near Samal Village
	: District- Dhenkanal (Odisha)
	: Latitude 21°04′N
	: Longitude 85°07′E
2. River	: Brahmani
3. Catchment Area (Sq. km)	
a) At Samal Barrage	: 30030
b) Between Rengali Dam & Samal Barrage	: 4780
4. River flow Rengali yields (mm^3) at Rengali Dam	
a) Mean (Annual)	: 13720.7 Mm^3
b) 75% dependability (annual)	: 10406.0 Mm^3
5. Design flood discharge (m^3/Sec)	
a) 100 year flood	: 24,632
b) Observed maximum flood	: 30,000
6. Top Barrage road level (m)	: 83.0
7. Pond level(m)	
a) Maximum (full pond level) (m)	: 76.2
b) Minimum (pond level) (m)	: 75.5
8. Maximum water level(m)	: 79.5
9. Storage between Maximum & Minimum Pond level (Mm^3)	: 20.10
10. Water spread area at full pond level (ha)	: 2880
11. Length of Barrage (m) (from abutment to abutment)	: 560.5
12. Under sluices	
a) Left 4 no.s	: 20.0m ×10.2m
b) Right 3 no.s	: 20.0m ×10.2m
13. Spillway	
a) Number of bays	: 17
b) Type, size of gates	: Radial, 20.0m ×9.2m
14. Silt excluder	: One

B. SALIENT FEATURES OF RENGALI RIGHT BANK CANAL (RBC)

1. Location of HR of RBC : Samal
2. Length of RBC (Main Canal) : 95.00 km
3. CCA of RBC (Gravity) : 84406 ha
4. Discharge at Head : 111.30 m^3/sec
5. CCA (Lift) : 19686 ha
6. Length (km) : 95.00 km
7. Cost of project : Rs. 2028.82 Crs (At 2010 Price level)
8. Cost per ha (CCA of 104090 ha) : Rs. 1.95 lakh / ha
9. Districts to be benefited : Angul, Dhenkanal, Cuttack & Jajpur

C. SALIENT FEATURES OF RENGALI LEFT BANK CANAL (LBC)

1. Location (H.R)of LBC : Latitude 21°30′N
   : Longitude 85°20′E
2. Length of LBC : 141 km
3. CCA of LBC : 1,14,300ha

	Gravity	**Lift**	**Total**
0-29.177 km	8483ha	3674 ha	12157 ha
29.177-141 km	93501 ha	8642 ha	102143 ha
Total	**1,01,984 ha**	**12,316 ha**	**1,14,300 ha**

4. Discharge at head (RD 0.00 km) : 151.864 m^3/Sec
5. No. and Size of head regular vents : 8 no.s (6m × 5.45m)

D. Sub projects

Particulars	**Sub projects – I**	**Sub projects – II**
I. Length (km)	0 km to 29.177 km	29.177 km to 141 km
II. CCA(Ha)/under gravity	8483ha	93501ha
III. Discharge at head (m3 / Sec)	151.864	145.268
IV. FSL at head (m)	75.5(RD 0km)	70.86
V. Bed width at head(m)	21.45	18.7m
VI. FSD at head (m)	4.3	4.5m
VII. Free board (m)	0.9	1.0m
VIII. Cropping intensity	190%	khariff - 90% Rabi - 85%

		Summer - 5%
		Perennial - 10%
		Total - 190%
IX.	Earth works	41.95 Mm^3
X.	Cost of project	INR 1958.34 Crores
XI.	Canal lining works in progress	lined from 29.177 to 41.36 km. & unlined from 41.36 to 141.00 km.
XII.	Districts to be benefited	Angul, Dhenkanal, Cuttack & Jajpur

2.2 COMPLIANCE TO CONDITIONS OF ENVIRONMENTAL CLEARANCE [EC - 1996]:

Status of the Compliance to conditions of Environmental Clearance 1996 is updated in June 2013. As per the proceedings of 16th meeting of the Project Level Environmental Management Committee (PLEMC) held in June 2013, the status of compliance is furnished in the table below:

Table No. C2-2: Environmental Clearances Conditions and Action Taken For Compliance

Environmental Clearance Condition	Action Taken To Comply with Conditions
1. Adequate free fuel arrangements should be made to the labour force engaged in the construction work on project cost.	Most of the construction works are executed mechanically by skilled labourers and local labourers revert back to their home after work. The supervision personnel and construction staff are using cooking gas / kerosene oil as their fuel. A condition is now incorporated in contracts for supply of free fuel to the land labour force engaged by contractors. OFD firewood depots have been opened at several places.
2. Catchment Area Treatment Plan should be strictly implemented	Out of the total CATP of 2500 ha to be taken up by DFO, Angul, so far 1800 ha.

with creation of necessary infrastructure facilities.	CATP has already been completed during the year 2010-11 to 2012-13.
3. Restoration of construction area should be ensured by levelling, filling up of borrow pits, landscaping etc. The area should be properly afforested with suitable plantation.	Restoration of construction area by levelling and filling up borrow pits has been done in several places and will be a continuing process during the entire construction period. As decided in 4th Project Level Environment Management Committee Meeting held on 27.07.2002, the stretches of canal, which are nearing completion, on both the left and right canal system, have been identified by the project authorities and intimated to Divisional Officers, Dhenkanal and Angul to work out a comprehensive action plan for creation of green belt. Works for canal bank plantation are being taken up.
4. For protection of wildlife and its habitat in the project impact area, the detailed action plan which is indicated in the "Conservation & Management of Wildlife Report" should be strictly followed.	The wildlife management plan has been prepared and the total cost of implementation works out to Rs 26.85 Crores. The user agency has deposited an amount of Rs 4.31 Crores with PCCF (Wildlife) and Rs 19.39 Crores in the CAMPA heads. As such balance Rs 19.39 Crores (Rs 26.85 Crores- Rs 4.31 Crores- Rs 0.04 Crores for 6 WHSs – Rs 2.75 Crores for 50 no.s of EFRs) has already been deposited with the DFO, Dhenkanal.
5. Kapilash along with other adjoining forest blocks should be declared as wildlife sanctuary immediately, by the State Government. Funds required for this purpose will be	Kapilash has already been declared as a wild life sanctuary. An amount of Rs 20 lakhs for Satkosia and Hadgarh has already been deposited with Forest Department.

made available by the project authority. The Forest Department should provide protection to the vegetation at Anantapur R.F. which is in a degraded state so that the vegetation cover is allowed to regenerate. An amount of Rs 1.50 Crores will be made available for the development of Satkosia and Hadgarh wildlife Sanctuaries. The money should be used for development of these two sanctuaries keeping in view that animals do not migrate and intrude on farmland, which they do at present.	Development Activities have already been undertaken by Forest Department. Future action will be taken in Kapilash Wild Life Sanctuary after getting fund from Department of Tourism.
6. For monitoring of the conservation and wildlife action plan, a representative of the Wildlife Institute of India, Dehradun and a representative of MoEF may be included in the monitoring committee. Ministry will nominate its representative from Expert Committee / Ministry official. The expenditure on wildlife management may be reviewed by these members to ensure the best possible use of funds for protection of the environment/ wildlife.	Project Level Environmental Management Committee has been constituted to ensure effective implementation of Environmental safeguard measures as stipulated by MoEF. Meeting is to be held once in three months. (Members: Director of Orissa State Prevention & Control of Pollution, Director of Social Forestry, Agriculture, Chief District Medical Officer, Forest Officers, Groundwater Survey & Investigation, Fisheries, Mines, Public Health Engineering, NGOs, regional representative of MoEF, representative of Wildlife Institute of India). State Level Environmental Monitoring Committee has been constituted for Water Resource Projects. Meeting to be held bi-annually (Members: DoWR, Forest, Revenue, SC & ST, Agriculture, Planning &

	Coordination, Health, NGO, Project level representatives). Till now 16 Project Level Environment management meetings have been held and the 16th Project Level meeting was held on 28th June 2013. Also four no.s of State Level Environment Management meeting have already been conducted.
7. Priority should be given to provide land in lieu of land to the project affected persons. Local NGOs should be associated along with State Revenue Department and the oustees to identify land for distribution. If NGOs and oustees feel that land is available, but the Project Authority is not in favour of allotting it, then the NGOs concerned and the oustees should refer this to the Ministry/Expert Committee. A statement in this regard may be submitted to the Ministry within six months.	Land for land is the accepted policy of the Govt. But it is not always possible to provide equivalent land of choice to the oustees. For rehabilitation of the project affected persons, NGOs have been associated. No displacement of persons has taken place in the canal excavation areas.
8. The minimum depth of groundwater is 2.5m in some blocks. Introduction of surface irrigation may result in increasing groundwater table leading to water logging conditions. Project authority should prepare command area development plan with drainage components. Necessary drainage and cross drainage work should be strictly	Groundwater survey conducted by the Lift Irrigation Corporation of Orissa indicates considerable variation in GWL from one locality to another in Dhenkanal district depending on soil types and underlying rock formation. Some of these measurements are to be maintained as baseline data by DoWR and post irrigation GWL are to be recorded over a number of years so as to observe rise / fall of GWL as compared to pre-irrigation period. Drainage in potential water logging

implemented with time bound targets.	localities is being surveyed and works will be taken up in due course. Since the land formation in LBC is generally slopping in nature, chances of water logging will be less. However, the GWL will be monitored when water flows in the canal and drainage and protective works will be undertaken if necessary. Cross drainage structures are being provided, where necessary during construction of the canal system. The GWS&I has asked for Command Area Map (Scale 1:50) of LBC & RBC with village & block wise details to carry out the detailed survey in the command area. A meeting was held on 27.11.2012 in the LO of CE&BM, BLB to review the progress. It was decided that map of the entire command area of both LBC & RBC showing village locations will be forwarded to the Director, GWS&I, who will frame the overall plan. Details of works to be taken up within the next 5 years will be programmed for further action over the matter. Observation of water quality of Brahmani River is constantly being done by Orissa Pollution Control Board. Samal Barrage is one of the observation sites. It has been observed that water of Brahmani river at Samal Barrage is suitable for irrigation purposes. The water quality data of Brahmani river is given in Page No. C3-47 of **Chapter 3.**
9. Health Plan should be strictly implemented, as proposed in	Action has been taken for implementation of stipulation in the said modified report in

the "Modified report on health measure for command area of Rengali Irrigation Project".	associated with CDMO, Dhenkanal and Angul. The malaria mitigation measures have been implemented by DoH and DoWR within a budget of Rs 0.43 Crores under JBIC Tranche-II loan, including I. Early diagnosis and prompt treatment II. Integrated vector control measures. III. Training IV. Information, communication, education V. Engineering Methods The procurement and implementation work, which was started in April 2006, has been completed by March 2010. Funds placed with CDMO, Dhenkanal as per their requisition from time to time has been fully utilized. Microscopes and furniture have been procured for all 12 microscopic centres and renovation works have been carried out as per necessity. 40 wall paintings (10 in each block) carrying different messages on malaria control have been made. 40 Awareness meetings with different stake holders at sub-centre level have already been conducted during 2006-07. OPD tickets with messages on malaria prevention have been introduced. Hatcheries have been activated by releasing Gambusia fish. Other activities for sensitization of villagers through rallies folk dance and other methods have also been done. The Regional Medical Research Centre

	(ICMR) at Bhubaneswar was engaged for post evaluation of malaria mitigation measures besides the concurrent evaluation by Voluntary Health Association of India. Final report has been received from VHAI as well as from RMRC.
10. Financial provision should be made in the total budget of the project for implementation of suggested safeguard measures.	Suggested safeguard measures will be implemented and financial provisions will continue to be made in the project budget as required every year. The project estimate contains a work package (No 76) only for implementation of Environmental Action Plan and environmental safeguard measures.
11. A multidisciplinary committee should be constituted with representatives from various disciplines to oversee effective implementation of the suggested safeguard measures.	At present effectiveness of project implementation including the implementation of suggested safeguard measures is being reviewed by the Project Level Environmental Monitoring Committee at regular intervals.
12. Six monthly monitoring reports should be submitted to the Ministry and its Regional office for review.	Proceedings of Project Level Committee meetings are submitted regularly.
13. Forestry clearance for diversion of forestland (2,159.43 ha) under Forest (Conservation) Act 1980 has to be obtained separately from Forest Authorities before starting any work.	Stage II clearance for 812 ha for phase-I work has been obtained. Action is being expedited to obtain Stage II clearance for the balance 1295 ha for the project.
14. Officials from Regional Office, BBSR, MoEF who would be monitoring the implementation of environmental safeguard should be given full cooperation, facilities and	Full cooperation and facilities are being extended and the documents / data are being furnished to the officers.

documents / data by project authorities during their inspection.	
15. The responsibility of implementation of environmental safeguards rests fully with the State Department / Project authority and they should ensure cooperation of the Central and State Government.	Agreed
16. Any Change in scope of the project will require fresh appraisal.	There is no change in the scope of the Project.
17. The Ministry reserves the right for additional safeguard measures subsequently, if found necessary and to take action including revoking of the clearance under the provisions of the Environment (Protection) Act 1986 to ensure effective implementation of suggested safeguard measures in a time bound and satisfactory manner.	Agreed.

Source: Proceedings of 16th meeting of Project Level Environmental Management Committee June 2013.

2.3 SUBPROJECTS OF LEFT BANK CANAL (LBC):

- Construction of Samal Barrage project and part of the Left Bank Canal (LBC) were initially undertaken by the State government from state resources. But construction of canal works could not advance due to resource constraint of the state.
- Strategic decision taken by the State to take up the balance works of canal construction through loan assistance from external and internal funding agencies.
- The instant study depicts the subprojects description of Left Bank Canal only.

2.3.1 SUBPROJECT – 1 / LBC–I [Rd 00 To 29.177 km]:

- Sub project –1, initially targeted up to RD 30 km was restructured as 00 to 29.177 km according to the completion status.
- Balance works of LBC 00 to 29.177 km along with Parjang branch canal, with all Distributaries, Minors and Sub minors were included in the scheme completion component of Orissa Water Resources Consolidation Project (OWRCP) undertaken through World Bank funding. The agreed works component was Rs. 1735.3 Million INR to provide flow irrigation to 8483 ha CCA.
- WRCP loan has been closed on 30th September 2004 leaving some balance work which approximately valued at Rs 20 Million INR.
- Potential Created under this subproject

Table No. C2-3: Statement Showing Block wise Irrigation potential created up to RD 29.177km

Name of canal Reach	Name of District	Ayacut (CCA) in ha	
		Name of Block	Ayacut in ha
LBC–I / 00 to 29.177 km	Angul	Kaniha	167.00
	Dhenkanal	Parjang	8316.00
		Total	**8483.00 ha**

2.3.2 SUBPROJECT – II LBC–II Phase–I: From 29.177 km to 71.313 km [42.136 km]

- The Second reach of LBC measuring main canal length of 42.136 km and its connected distribution System has been posed to Japan International Corporation Agency Ltd (JICA) for funding assistance during the year 1997.
- The irrigation potential under this subproject was identified as 29,176 ha which includes 26946 ha flow and 2230 ha lift irrigation in different blocks of Dhenkanal and Jajpur districts.

2.3.2.1 Ayacut coverage:

Table No. C2-4: Statement Showing Block Wise Irrigation Potential in Phase I (29.177 km to 71.313 km)

District	Block	Area (Ha)
Dhenkanal	Parjang	176
	Kamakhyanager	17,516
	Bhuban	9,164
	Kankadahada	2,320
	Total	**29,176**

Table No. C2-5: Sub system wise break up of JICA assistance

Subsystem	Command area
Bhairpur Branch Canal (BBC)	10,947 ha
Left Bank Canal	13,238 ha
Lift Irrigation	2,780 ha
Land for future Agricultural development	2,211 ha
Total	**29,176 ha**

2.3.2.2 Scope of Construction:

- Construction of main canal ------ 1 no LBC = length 42.136 km
- Construction of Branch Canal --- 1 no BBC = length 34.780 km
- Construction of Distributaries---- 7 no.s = length 51.442 km
- Construction of minors ---------- 73 no.s = length 197.15 km
- Construction of sub minors ------ 93 no.s = length 91.735 km
- Lift Irrigation development ------ 25 no.s ----------

2.3.2.3 JICAs Loan Assistance:

The agreed loan assistance for the above subproject was available to the state Government in three tranches.

Box No. 5: Loan Agreement with JICA

Agreement reference	Amount	Effective period
Tranche I (ID – P-135)	2270 million INR	5th Feb 1998 to 31st Dec 2004
Tranche II (ID – P-154)	2450 Million INR	18thjune 2004 to 18thjune 2011
Tranche III (ID – P-210)	1551.58 Million INR	24th Nov 2010 to 24th Nov 2015

Tranche III stipulates completion of civil works by June 2012.

2.3.2.4 Status of Package Completion:

The work under the above loan assistance LBC–II Phase-I is substantially completed by 2012 except for some **soft component** and construction of one additional CR cum Escape.

2.3.2.5 Activities under Soft Components:

- **Formation of Water Users Association [WUA]**
  - Formation of WUA entrusted to WALMI (Odisha) in accordance to provision under Pani Panchayat Act 2002
  - 27 WUAs have been formed by September 2007

- **Entry Point activities [EPA]**

- 4 no.s Pani panchayat in Bhairpur branch canal and LBC-II have been selected in joint collaboration of DoWR, WALMI and JICA.
- The EPA works entrusted to WALMI, Odisha
- Activities included are:
    - Socio Economic baseline survey
    - Participatory Rural Appraisal (PRA) meetings
    - SHG Formation
    - Soil Tests
    - Inter Departmental Co-ordination meetings
    - Participatory Walk Through (PWT)
    - Pre Khariff meeting
    - Market Survey
    - Income generation activities
    - Training and workshop programme.

- **Malaria Mitigation Measures (MMM)**
    - Implemented by DoWR and DoH
    - Activities completed as per MMM action plan
- **On Farm Development works [OFD]**
- **Agricultural Intensification Programme [AIP]**
- **Some other activities include Institutional strengthening of WALMI, preparation O&M guidelines for WUA's and sociology study conducted by PMC.**

The general layout map of LBC–II Phase–I is furnished in **Fig.No.C2-1.**

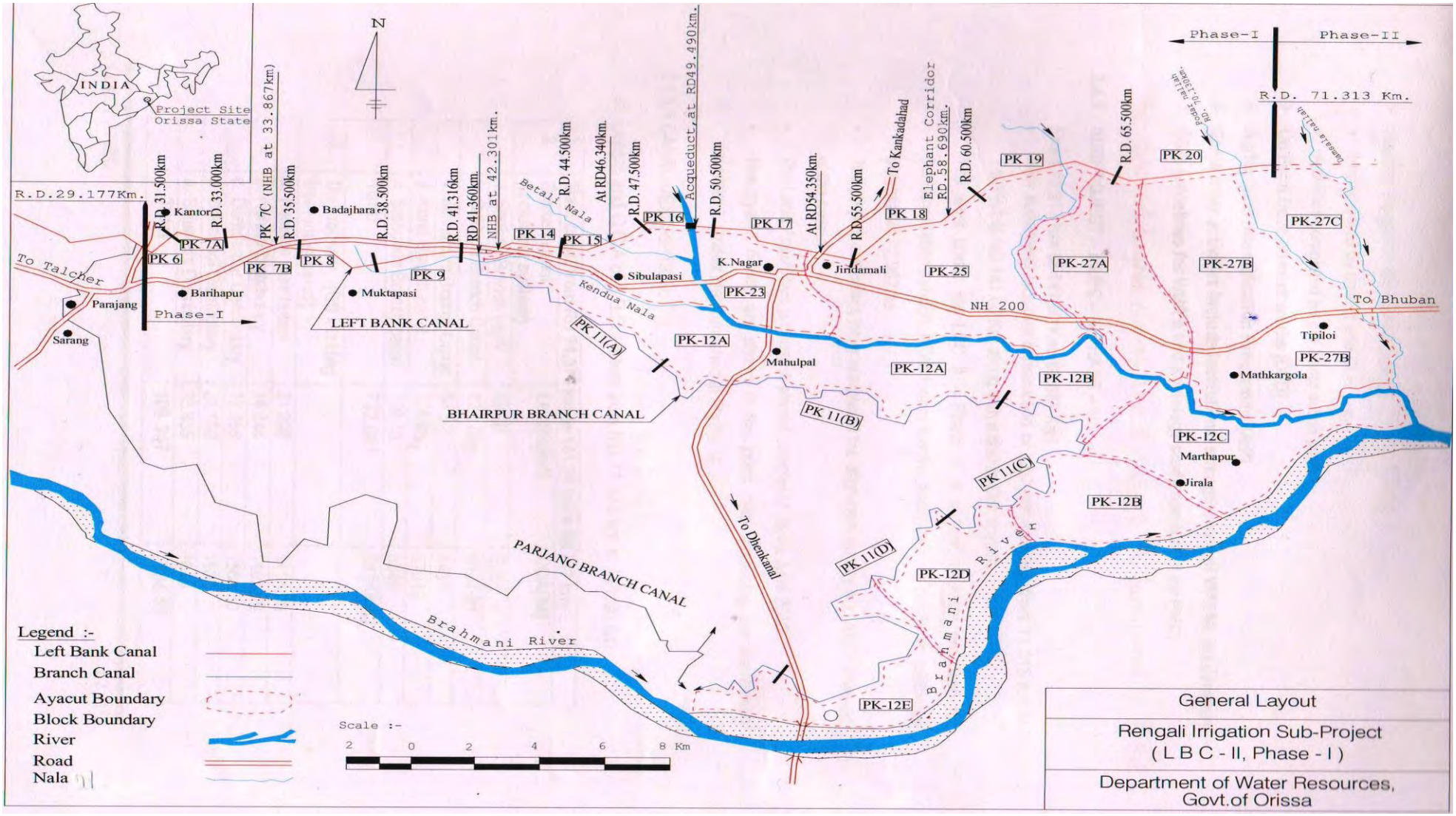


Fig.No.C2-1: General Layout of LBC-II Phase-I

2.3.3 SUBPROJECT–II LBC–II PHASE–II:

From 71.313 km to 141.00 Km [69.687 km]

- This subproject includes construction of LBC commencing from 71.313 km to Tail End at RD 141.00 km along with it distribution system.
- The work under the LBC-II Phase-II is a **new proposa**l proposed for implementation through JICAs further funding assistance, to create an additional potential of 72,967 ha
- The project authorities have completed the alignment survey and micro planning of the ayacut.
- The Land Acquisition process has progressed considerably.
- The ayacut details are shown in the index map, furnished in **Fig.No.C2-2**, describing the distribution system.
- Distribution of Ayacut district wise is furnished in **Table No. C2-6**

Table No. C2-6: District & Block Wise Ayacut Distribution

Name of Canal System	Name of District	Name of Block	Ayacut Area CCA in Ha.
LBC (Main Canal) from RD. 71.313 km. to 141.00 Km. including all Distributary system.	Dhenkanal	Kankadahad	600
		Bhuban	9756
	Jajpur	Sukinda	13920
		Danagadi	10009
		Korai	22491
		Rasulpur	180
	Keonjhar	Ghasipura	13205
		Anandapur	2806
Total	**3**	**8**	**72967**

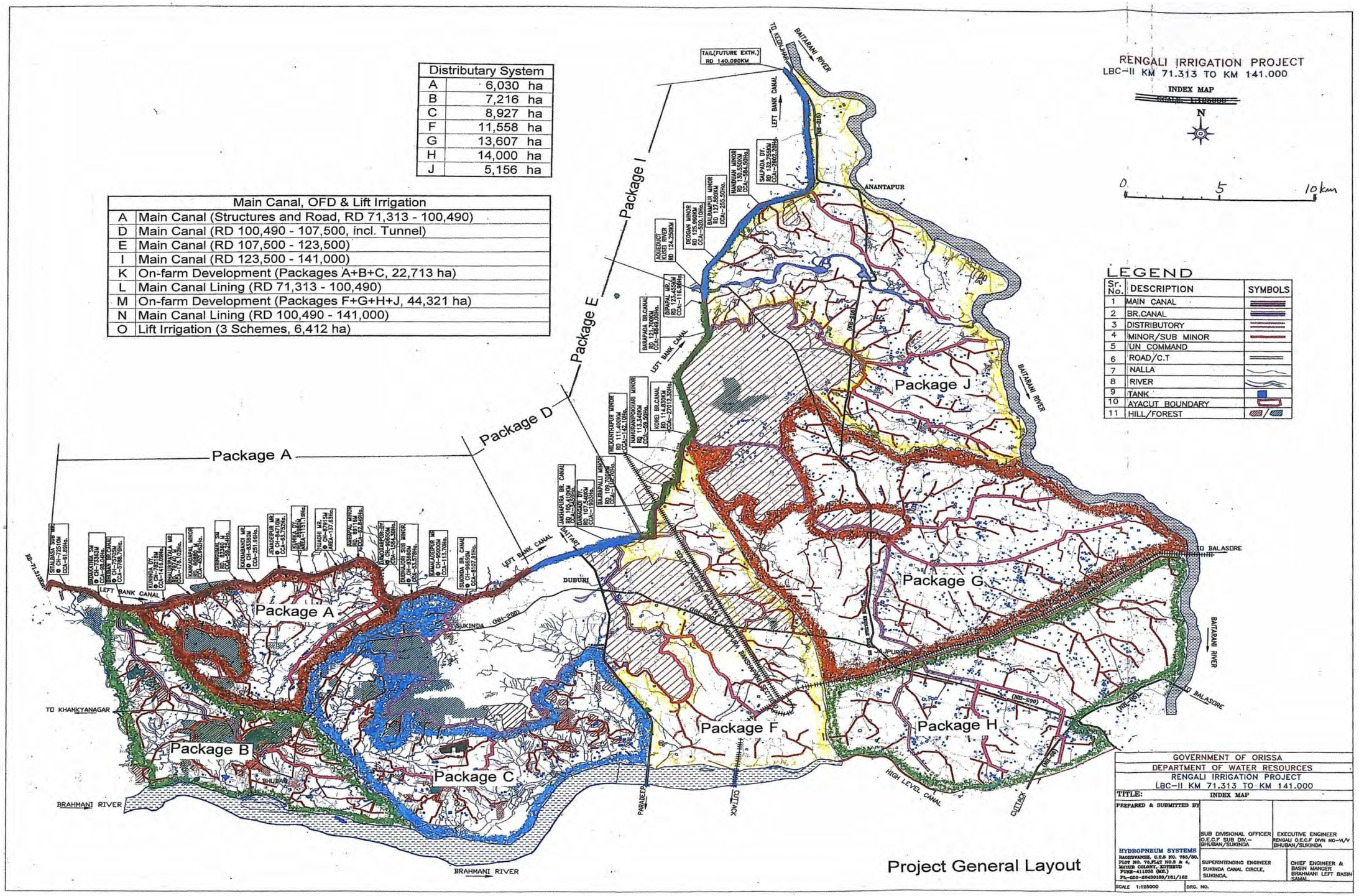


Fig.No.C2-2: Index Map showing Distribution System

2.3.4 Description of the subproject LBC–II Phase-II:

Construction of Rengali Irrigation Left Bank Canal is undertaken in two subprojects LBC–I and LBC-II, the later being further phased as LBC–II Phase-I and LBC–II phase–II. The phasing details are furnished below.

Table No. C2-7: Construction Phasing of LBC

Canal	Subproject phase	Chainage RD in kms	Length in kms	Ayacut (ha)			Status
				Flow	Lift	Total	
Left Bank Canal (LBC) length 141.0 Km	Subproject I LBC-I	00 to 29.177 Km	29.177	8483	3674	12157	Completed through WB funding
	Subproject II LBC-II Phase-I	29.177 Km to 71.313 Km	42.136	26946	2230	29176	Works almost completed through JICA funding, except for some study on soft components etc.
	Subproject II LBC-II Phase-II	71.313 km to 141.00 km	69.687	66555	6412	72967	Proposed for JICA funding 2013 -14
Total	LBC-II	00 to 141.00 km	141.00	1,01,984	12316	1,14,300	

- In the previous phase, LBC–II Phase-I the funding agency JICA have stipulated completion of all Civil works by June 2012.
- At the instance, the subproject is substantially completed except for some on-going activities under the Soft component.
- Govt. of Odisha, in the meanwhile decided to undertake a part of the 3rd and concluding phase of LBC, from the state fiscal resource.
- The part length of reach 1 preferred by DoWR was LBC-II Phase-II from RD 71.313 km to 100.49 km (**here in after Reach 1 LBC-II Phase-II**) comprising of construction of main canal for a length of 29.177 km including its 2 no.s, Branch Canals, 3 no.s of Distributaries and 11 no.s of Minors & sub minors with ayacut Coverage of 19579.96 ha. in Dhenkanal district and part of Jajpur districts. Of this; the construction of 29.177km long main canal is in progress through state's own resource. The distribution system will be carried over to Reach 2.
- The reason for preferring Reach I of LBC-II up to RD 100.49 km is attached to high cutting reach appearing between RD 100.49 km to 103.46 km, where construction of a tunnel is proposed.
- The balance portion of LBC-II Phase-II from RD 100.49 km to 141.00 km including the tunnel length forms the **Reach 2** (here in after Reach 2 LBC-II Phase-II) as well as balance works of Reach 1 i.e. the distribution system.
- The canal system appearing in Reach I and Reach II are described in **Table No. C2-8** and **Table No. C2-9** respectively.

Table No. C2-8: Canal system for Reach – I / LBC-II Phase-II from RD 71.313 km to 100.490 km

Sl. No	Name of the off taking Canal System	Off taking Chainage of Main Canal IN (RD km)	Length of off taking Canal (in km)	Discharge at off take (In Cum sec)	Ayacut (In ha)
1.	SITALABASA SUB MINOR	72.510	0.855	0.057	61.890
2.	BADAKATHIA SUB MINOR	73.363	0.785	0.090	98.040
3.	BHUBAN BRANCH CANAL	75.705	95.000	6.005	5788.760
4.	KUNINDA DISTRIBUTARY	78.218	21.085	1.465	1416.090
5.	BHALUKIPATALA MINOR	79.740	1.500	0.151	176.100
6.	KANKADPAL MINOR	80.880	5.945	0.412	452.960
7.	GIRINGAMALI MINOR	82.360	0.810	0.052	59.250
8.	KADUABANDI MINOR	83.380	1.845	0.220	251.960
9.	JEMADEIPUR SUB MINOR	84.710	0.690	0.057	63.750
10.	KUHIKA DISTRIBUTARY	85.950	13.895	1.188	1151.180
11.	NUADIHI MINOR	87.915	1.530	0.125	137.630
12.	AMBAPAL SUB MINOR	89.116	0.075	0.057	62.850
13.	DAMODARPUR DISTRIBUTORY	90.635	17.859	1,617	1584.310
14.	DUDHAJODI SUB MINOR	93,660	0.840	0.048	53.580
15.	KAMALDEIPUR MINOR	95.000	2.010	0.104	113.710
16.	SUKINDA BRANCH CANAL	96.650	132.468	8.273	8107.930
TOTAL REACH I / LBC-II PHASE-II		71.313 TO 100.49	297.192	--------	19579.960

Table No. C2-9: Canal system for Reach – II / LBC-II Phase-II from RD 100.490 to 141.00 km

Sl. No.	Name of the off taking Canal System	Off taking Chainage of Main Canal IN (RD km)	Length of off taking Canal (in km)	Discharge at off take (In Cum sec)	Ayacut (In ha)
1.	JAKHAPURA BRANCH CANAL	105.47	3.715	3.842	3.459
2.	DANAGADI DISTRIBUTORY	107.54	12.870	1.985	1903.05
3.	BAJRAPALLI MINOR	109.76	1.935	0.102	111.55
4.	NILAKANTHAPUR SUB MINOR	111.50	1.215	0.083	89.99
5.	NAHURANI POSI SUB MINOR	113.195	0.885	0.048	51.73
6.	KOREI BRANCH CANAL	114.83	27.00	30.337	27012.0
7.	BARAPADA BRANCH CANAL	121.700	13.654	7.429	6777.00
8.	DIPAPAL MINOR	123.455	1.750	0.124	133.77
9.	DEOGAON MINOR	126.000	5.415	0.429	467.61
10.	BAIRAMPUR MINOR	127.970	1.965	0.208	222.60
11.	NANDUAN MINOR	130.065	5,460	0.429	472.75
12.	SALAPADA DISTRIBUTORY	132.800	12.150	1.691	1640.75
TOTAL REACH-II / LBC-II PHASE-II		100.490 to 141.00		---------	42341.8

Source: Survey and Investigation of macro distribution system of OECF Division No. V

2.3.5 System Description of Left Bank Canal – LBC-II Phase-II

[A] Flow diagram describing the canal system

The Reach wise canal system is summarized below in **Table No. C2-10** and a schematic flow diagram of the distribution network which are directly off taking from the main canal is shown in **Fig.No.C2-3(i)** and **Fig.No.C2-3(ii).**

Table No. C2-10: Summary statement of L.B.C system from RD 71.313 km to 141.00 km

1.	**Main canal from RD 71.313 km to 141.00 km = 69.687 km**		
2.	**Branch canal (including system)**	**Length(km)**	**CCA(ha)**
	a. Bhuban Branch canal	95.00	5788.76
	b. Sukinda Branch Canal	136.793	8107.91
	c. Jakhapura Branch Canal	64.37	3459
	d. Korei Branch canal	326.658	27012
	e. Barapada Branch canal	109.18	6849
	Total	**732.001**	**51216.67**
3.	**Distributary (Off taking from main canal)**		
	a. Kuninda Distributary	21.808	1416.09
	b. Kuhika Distributary	14.345	1151.19
	c. Damdarpur Distributary	17.859	1584.30
	d. Danagadi Distributary	31.100	1903
	e. Salapada Distributary	23.835	1640
	Total	**108.947**	**7694.58**
4.	**Minor/Subminors (Off taking from main canal)**		
	a. Bhalukipatla minor	1.50	176.102
	b. Kaduabandi minor	1.845	251.96
	c. Kankadapal	5.945	452.962
	d. Nuadihi minor	1.53	137.63
	e. Sitalabasa s/m	0.885	61.89
	f. Badakathia s/m	0.785	98.04
	g. Giringamal s/m	0.810	59.254
	h. Jemadeipur s/m	0.69	63.752
	i. Ambapal s/m	0.75	62.849
	j. Bajarpalli minor	1.935	111
	k. Nilakanthapur minor	1.215	89
	l. Nahuranipasi minor	0.885	51
	m. Dipapal minor	1.75	133
	n. Deogan minor	7.425	591
	o. Balarampur minor	3.795	348
	p. Nandua minor	9.550	472
	Total	**41.295**	**3159.439**
5.	**Lift Canal (Off taking from main canal)**		
	Lift Canal No.	**RD (km)**	**C.C.A**
	1	101.110	2992
	2	106.700	88.20
	3	119.750	3332
	Total 3 no.s		**6412.20**

Note: Ayacut covered by direct outlets are additional to the above figure.

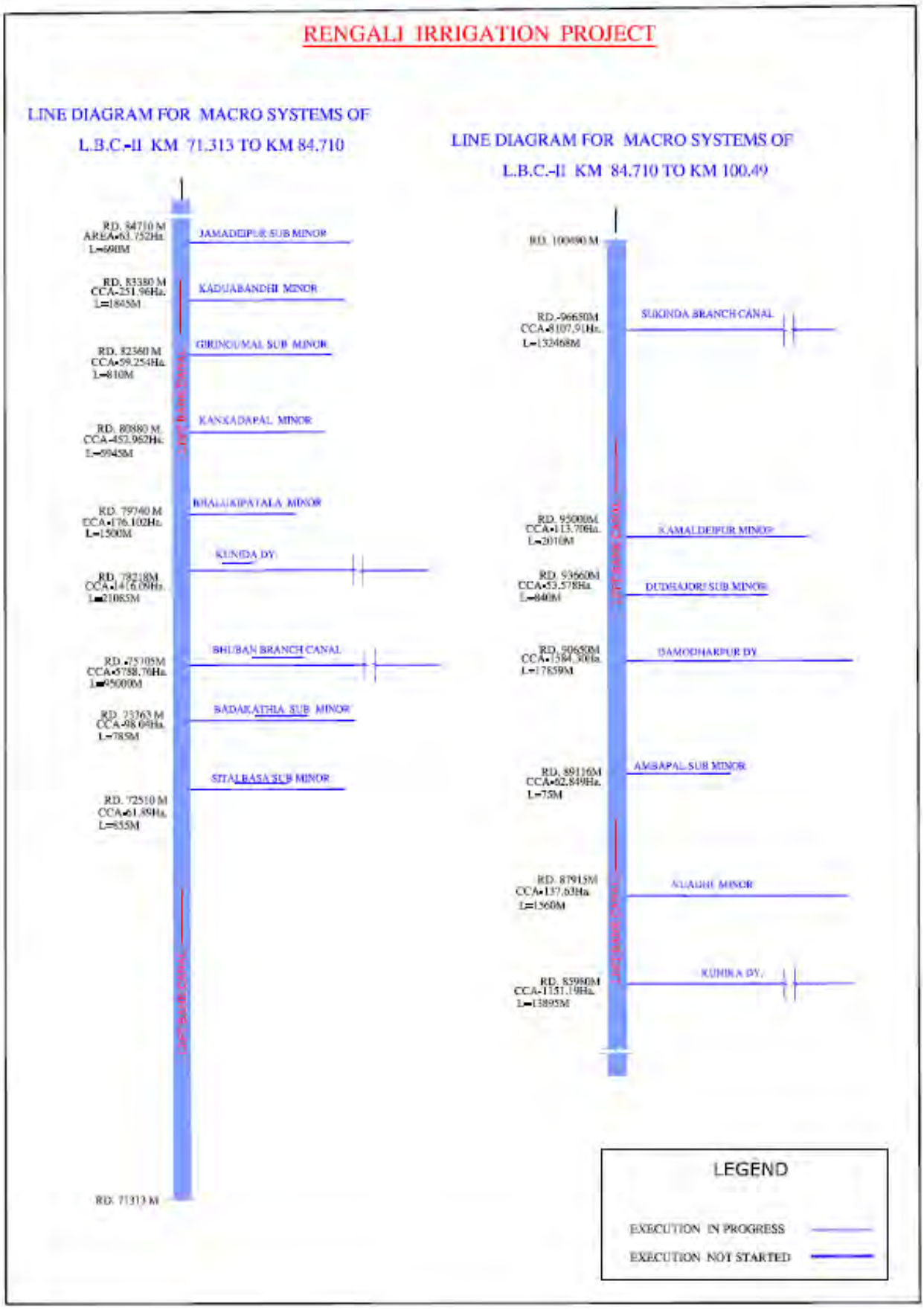


Fig.No.C2-3(i): Schematic Flow Diagram of Canal System

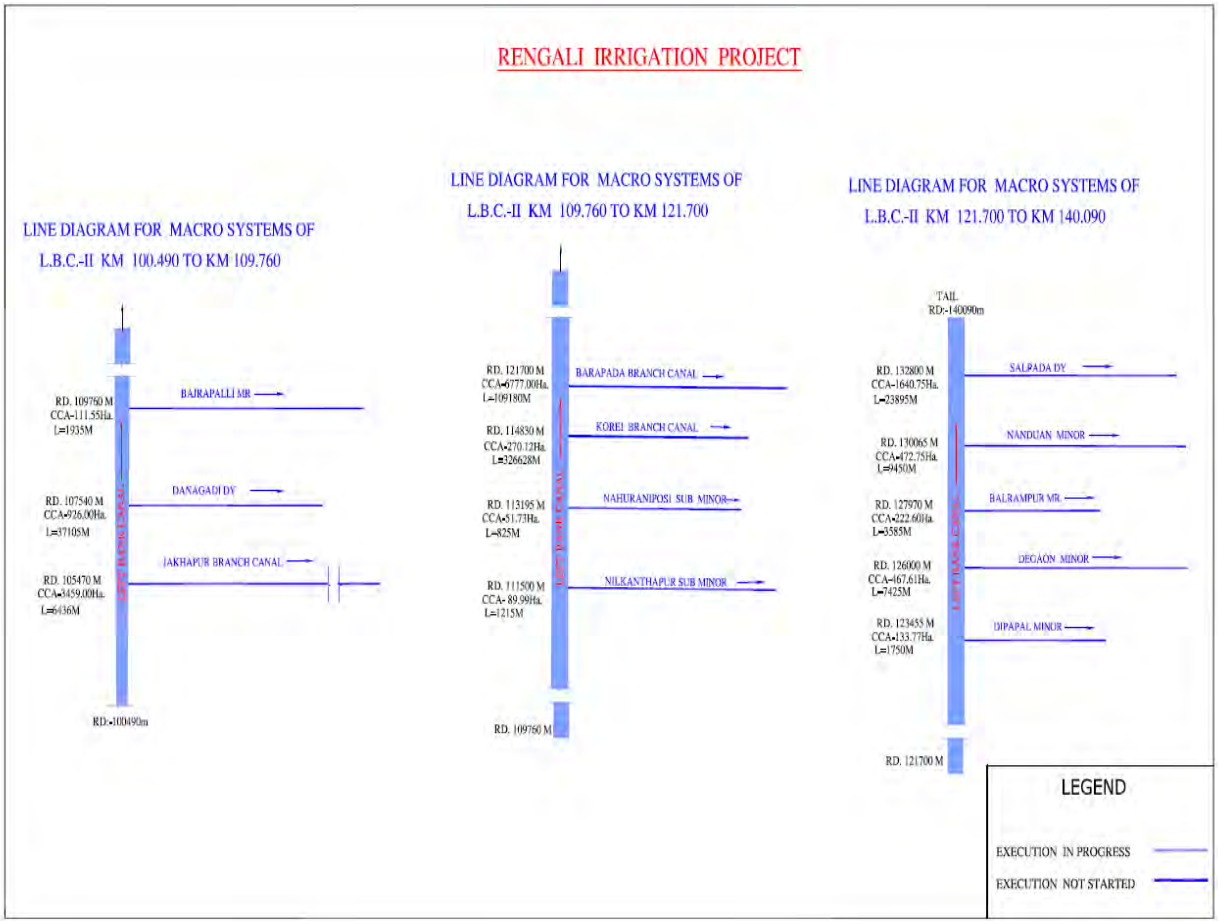


Fig.No.C2-3(ii): Schematic Flow Diagram of Canal System

[B] Design Particulars for Sample Canals

The design particulars of sample canals, i.e. For Main Canal, Branch Canal, Distributary and Minors etc have been finalized. Particulars for sample canals furnished in **Table No. C2-11.**

Table No. C2-11: Design Particulars of Canal Systems

Sl. No.	Name of Sample Canal	Design Discharge Q=cumsec	Velocity (m/sec)	Bed level (m)	FSD (m)	Side Slope	FSL (m)	Free Board	Bank Width L/R	Bed Width (m)
1	Main Canal (L.B.C) At RD 100.490	90.752	1.753	57.500	4.10	Inner-1:0.50 Outer-1:2	61.600	1.00	5.00 m & 8.00 m	11.60
2	Branch Canal (Korei)	30.337	0.912	56.753	2.70	1:1.50	59.453	0.75	6.00 m & 2.50 m	7.90
3	Distributary (Salpada)	1.691	0.476	55.356	0.90	1:1.50	56.256	0.50	5.00 m & 1.50 m	2.60
4.	Minor (Nandua)	0.429	0.440	56.230	0.50	1:1.50	56.730	0.50	5.00 m & 1.50 m	1.20

[C] Typical Canal Cross Sections

Approved dimensions for Cross section of canals according to the cutting and filling reaches are furnished in **Fig.No.C2–4(i)** and **Fig.No.C2–4(ii).**

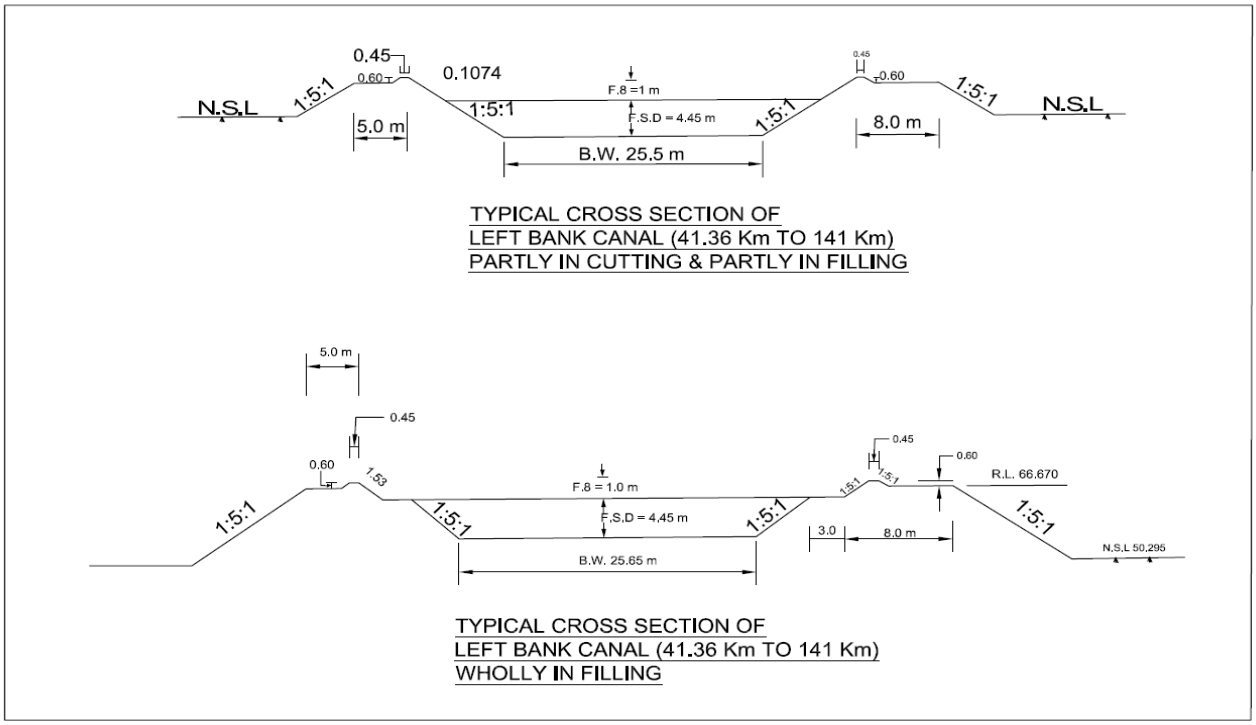


Fig.No.C2–4(i): Typical Canal Cross Section of LBC from R.D. 29.395 km to 141.00 km

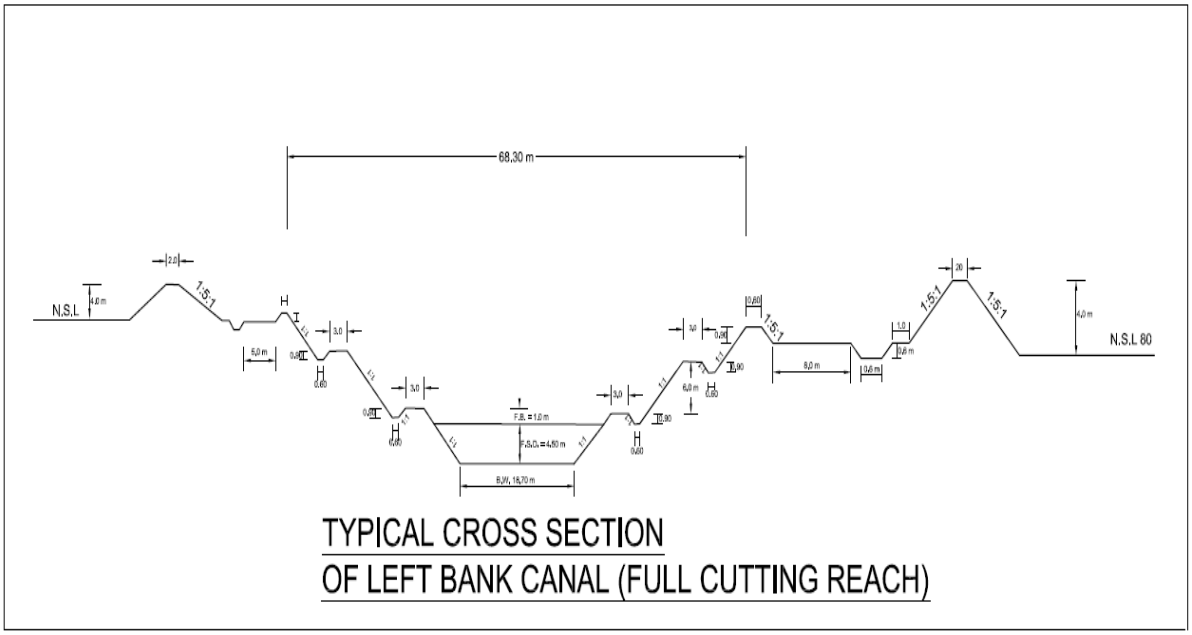


Fig.No.C2–4(ii): Typical Canal Cross Section of LBC from R.D. 29.395 km to 41.360 km

2.4 Project Implementing Action by DoWR:

Department of Water Resources (DoWR), Government of Odisha (GOO) is intent on implementation of the concluding phase of left Bank Canal i.e. LBC-II Phase–II earliest by 2013-14 to promote agriculture benefits for the people of Dhenkanal, Jajpur and Keonjhar districts.

- Based on the successful performance in completing the previous phase LBC–II Phase-I (29.177 km to 71.313 km) through JICA funding assistance, the Govt. of Odisha have once again approached JICA also extend funding support for implementation of phase–II works.
- While processing paraphernalia for the loan agreement with JICA, the DoWR have lost no time to create infrastructure for commencement of works under phase – II. As a result, the concluding phase of LBC has been split into two reaches, i.e. reach I (from RD 71.313 km to 100.49 km) and reach II (from RD 100.49 km to 141. 00 km)
- In the process various activities undertaken as pre-construction preparedness by DoWR are briefed below and shown in **Table No. C2-12.**

Table No. C2-12: Pre-Construction Preparedness By DoWR

Sl. No	Activity	From RD 71.313 km to 100.49 km	From RD 100.49 km to 141. 00 km
1	Land acquisition	Substantially Completed	Status furnished in statement vide **Table No. C2-13**
2	Micro planning of Ayacut	Completed	Completed
3	Information on affected villages, private properties and population	• Identified • Payment of compensation on land & property in process • Statement furnished **in Table No. C2-14**	• Identified • Payment of compensation on land & property in process • Statement furnished in **Table No. C2-14**
4	Preparation of Design of Drawing I. Design statement for Canals II. Design of Tunnel (RD 100.49 km to 103. 40 km) III. Design of structure	• Completed • Copy furnished in **Annexure No. VII** • Out of total 66 structures in LBC, design & drawing approved for 52. • Out of 2922	• Completed • Copy furnished in **Annexure No. VIII** • Data furnished to CWC (Govt. of India) for design & drawing • Out of total 93 structures in LBC,

	IV. LBC V. Distributary & Minors	structure, Design & Drawing availed 100% • Status of Design & Drawing undertaken by 09/2013 is furnished in **Table No. C2-15**	Design & Drawing completed for 32 no. • Out of total 4160 no. structure, Design & Drawing completed for 3109 structure. • Status of Design and drawing undertaken by 09/2013 is furnished in **Table No. C2-15**
5	Canal system included for phased implementation.	• Civil works of L.B canal from RD. 71.313 to 100.49 km is listed & furnished in **Table No. C2- 16**	• Canal system proposed for execution is listed and furnished in **Table No. C2- 17**
6	Procurement packages	Construction of Main canal from R.D 71.313 km to 100.49 km is under execution from state funding.	• Earlier 29 packages (Pkg. 35 to pkg. 64) are being restructured • Procurement action will be initiated after confirmation of loan agreement with JICA

Source: Project Authority (RIP)

2.5 MONITORED STATUS OF IMPLEMENTATION:

[A] Construction Status:

The work status of Reach I (LBC–I Phase-II) from RD 71.313 km to 100.49 km is on-going through contract packages, as revealed from site evidence vide **Plate No.C2-1.**

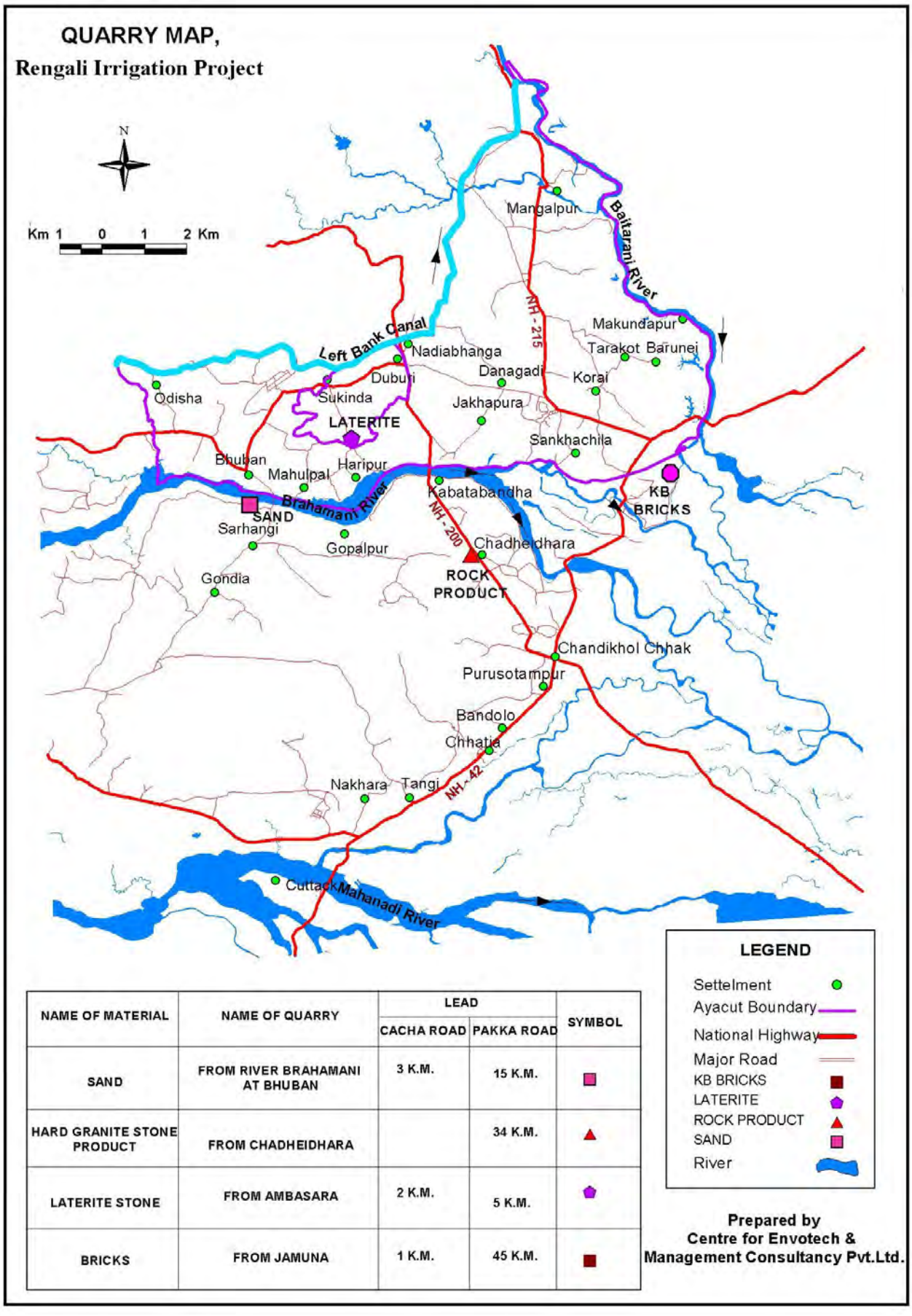


Plate No. C2-1: Work Status of Reach I (LBC–I Phase-II) up to 100.49 km

[B] Location of Quarry for construction materials:

Quarry areas for different construction materials have been identified in consultation with the Revenue authorities of the locality.

The quarry map is furnished in **Fig.No.C2–5.**



NAME OF MATERIAL	NAME OF QUARRY	LEAD		SYMBOL
		CACHA ROAD	PAKKA ROAD	
SAND	FROM RIVER BRAHAMANI AT BHUBAN	3 K.M.	15 K.M.	
HARD GRANITE STONE PRODUCT	FROM CHADHEIDHARA		34 K.M.	
LATERITE STONE	FROM AMBASARA	2 K.M.	5 K.M.	
BRICKS	FROM JAMUNA	1 K.M.	45 K.M.	

Fig.No.C2–5: Quarry Map of Rengali Irrigation Project (R.I.P)

Table No. C2 – 13: Status of Land Acquisition of LBC–II of RIP from RD 100.490 km to RD 140.09 km as on June 2013

Sl. No	Canal system	No. of Cases	Area in Ac.	4(1) Stage			6(1) Stage				U/S - 7		Payment Stage					Remarks
				Objection complied	L.A.O	Revenue Dept.	L.A.O	RDC	DoWR	Revenue Dept.	Spl. L.A.O	Revenue Dept.	Payment to be made	Payment made	Possession Received	Govt. Land in Ac.	Private Land In Ac.	
1	Main Canal	31			19	3		3	3			3				209.80	664.39	
2	Distributary	280			264	6	6	2	1	1						489.17	3004.53	
	Total	**311**			**283**	**9**	**6**	**5**	**4**	**1**		**3**				**698.97**	**3668.92**	

Source: -DPR/ Project Authority

Table No. C2 – 14: Information on affected village & persons of LBC from RD 71.313 km to 141.00 km

Name of Division: Left Canal Division No. I, Sukinda

Sl. No	Name of the Canal / No. of villages	No. of affected families	Compensation / Resettlement Necessary						Already Compensated						Balance					
			Land in Ac.	Shop Nos.	House hold Nos.	Squatters No.s	Other structures No.s.	No. of Trees	Land in Ac.	Shop No.s	House hold No.s	Squatters No.s	Other structures No.s	No. of Trees	Land in Ac.	Shop No.s	House hold No.s	Squatters No.s	Other structures No.s	No. of Trees
1	Subtotal of LBC (71.313 to 100.49 km) 163 villages	10469	1834.99	1	111	66	257 Nos.	1568	466.86	0	56	0	27	77	1368.13	1	55	66	230 Nos.	1491
2	Subtotal of LBC (100.49 km to 141.00 km) 34 villages	1799	844.51	0	29	112	Pond – 2 Well – 5 Samadhi - 12	543	81.61	0	0	0	Samadhi – 1	47	762.9	0	29	112	Pond – 2 Well – 5 Samadhi - 12	543
3	Subtotal of Distributaries (100.49 km to 141.00 km) 353 villages	14142	3029.51	0	35	26	Sch -2 Mandap –1	0	0	0	0	0	0	0	3029.51	0	35	26	Sch -2 Mandap – 1	0
	Grand Total	26410	5709.01	1	175	204	Pond – 2 Well – 5 Samadhi – 12 Sch -2 Mandap –1	2111	548.47	0	56	0	27	124	5160.54	1	119	204	Pond – 2 Well – 5 Samadhi- 12 Sch -2 Mandap – 1	2034

Source: --*DPR/ Project Authority*

Table No. C2–15: Status of Design and Drawing for Canal Structures as on September 2013

Reach	Canal System	HR[s]/CR[s] (no.s)	Falls (no.s)	M.D.R Crossings (no.s)	VRB / NH Crossings (no.s)	VRB cum falls (no.s)	Drainage Crossing (CDs)	Outlets (no.s)	Total structures (no.s)	Total No.s Approved (no.s)	Balance structures / no.s Achievement
REACH - I LBC - II PHASE – II	Left Main Canal RD 71.313 TO 100.49km	18	-----	------	21	----	27	------	66	52	14 no.s Achievement 78.78%
	Branch Canal Distributary minors and Sub minors RD 71.313 TO 100.49km	116	1274	133	338	8	344	709	2922	2922	Nil Achievement 100%
REACH - II LBC - II PHASE – II	Left Main Canal RD 100.490 to 141.00 km	12	----	----	39	----	42	-----	93	32	61 No.s Achievement 34.40%
	Branch Canal Distributary minors and Sub minors RD 100.490 to 141.00 km	222	1416	223	578	-----	330	1391	4160	3109	1051 Achievement 74.73%
LBC Phase-II	Total	368	2690	356	976	8	743	2100	7241	6115	1126

Table No. C2-16: Civil works of L.B canal from RD. 71.313 to 100.49 km:

Sl. No.	Canal system of B.L.B canal from RD. 71.313 to 100.49 km	Ayacut area C.C.A(ha)	Length of canal in km
1.	Main canal from R.D 71.313 km to 100.490 km		29,117
2.	Bhuban branch canal with 2 no.s distributary, minors & sub - minors	5788.76	95.00
3.	Sukinda branch canal with 2 no.s distributary, minors & sub – minors	8107.91	136.793
4.	Kuninda distributary, minors & sub – minors (Completed)	1416.09	21.808
5.	Kuchika distributary from main canal	1151.19	14.345
6.	Damodarpur distributary	1584.30	17.859
7.	Bhalukipatala Minor off taking from main canal (Completed)	176.102	1.50
8.	Kaduabandi Minor off taking from main canal (Completed)	251.96	1.845
9.	Kankadapal minors & sub – minors Minor off taking from main canal.	452.962	5.945
10.	Nuadihi minor	137.63	1.53
11.	Sitalabasa Sub – Minors	61.89	0.885
12.	Badakathia Sub – Minors	98.04	0.785
13.	Giringamal Sub – Minors	59.254	0.810
14.	Jamadeipur Sub – Minors	63.752	0.69
15.	Ambapal Sub – Minors	62.849	0.75
	Total [A]	**19412.689**	**329.662**

Note: Sl no-1 is under execution from state funding.

Table No. C2-17: System Proposed For Execution

Sl. No.	Canal system of B.L.B canal from RD. 100.490 to 140.090	Ayacut area C.C.A(ha)	Length of canal in km
1	Main canal from R.D 100.490 km to 140.090km (Completed)		39.60
2	Korai branch canal with 6 no.s distributary minors & sub - minors	27012	326.658
3	Barpada branch canal with 2 no.s distributary, minors & sub - minors	6849	109.18
4	Jakhapura branch canal with 2 no.s distributary, minors & sub - minors	3459	64.37
5	Danagadi distributary from main canal	1903	37.100
6	Bajarpalli Minor off taking from main canal	111	1.935
7	Nilakanthapur Minor off taking from main canal (Completed)	89	1.215
8	Nahuraniposi Minor off taking from main canal (Completed)	51	0.885
9	Salapada distributary including its minors & sub – minors Minor off taking from main canal	1640	23.835
10	Dipapal Minor off taking from main canal	133	1.75
11	Deogaon Minor off taking from main canal	591	7.425
12	Balarampur Minor off taking from main canal	348	3.795
13	Nandua Minor off taking from main canal	472	9.550
	Total [B]	**42658**	**627.258**

Total CCA (A+B) = 19412.689 ha + 42658 ha = 62070.689 ha

Total Length (A+B) = 329.662 km + 627.258 km = 956.920 km

CHAPTER – 3
ENVIRONMENTAL BASELINE DATA

3.0 OBJECTIVE:

The objective of conducting baseline survey of the existing environmental settings and data collection is to provide a data base for predicting the likely changes that are expected in implementation of the project. Simultaneously, it provides a reliable platform for monitoring such changes in the operation phase. This chapter deals with the approach for data collection, Environmental scoping / identification of Environmental attributes and baselines survey details.

3.1 STUDY AREA:

Rengali Left Bank Canal (LBC) RD 29.177 km to RD 71.313 km under LBC–II Phase-I has been completed and Main canal construction carried out up to 71.313 km. The New proposal entails construction of LBC from RD 71.313 km to 141.00 km under LBC–II Phase–II. The alignment is taken through three districts namely Dhenkanal, Jajpur and Keonjhar districts and Caters an ayacut of 72,967 ha distributed amongst these districts.

The study area with the above features is described with River Brahmani flowing W – E direction forming the southern boundary while the river Baitarani flowing N–S direction forms the eastern boundary the study area is thus demarcated with geo–coordinate at strategic locations, as showing in the location map furnished in **Fig.No.C3-1**

Table No. C3-1: Identification of Study Area

SL. No	Significant locations		Geo – Coordinates	
	Station Numbers	Significance	Latitude (North)	Longitude (East)
1	A	Starting Point E of LBC–II Phase–II at RD 71.313 km at Village BIRAPAL in Dhenkanal	20°-59′-30″	85°-41′-40″
2	B	LBC–II at RD &79.160 km and Districts Boundary of Dhenkanal/ Jajpur dist.	20°-59′-00″	85°-46′-30″
3	C	LBC–II RD 98.600 km	20°-59′-00″	85°-46′-20″
4	D	LBC–II RD 106.100 km	20°-00′-30″	85°-58′-45″
5	E	LBC–II RD 113.00 km Districts boundary	21°-04′-00″	86°-02′-00″
6	F	LBC–II RD 117.300 km Districts boundary, Keonjhar	21°-05′-45″	86°-02′-00″

7	G	LBC–II RD 125.80 km Kusei River Crossing	21°-09′-30″	86°-02′-30″
8	H	LBC–II RD 141.00 km	21°-15′-50″	86°-02′-30″
9	I	Hatadihi Block on river Baitarani	21°-09′-50″	86°-11′-30″
10	J	Baitarani river / District Boundary	21°-03′-30″	86°-12′-15″
11	K	Near Rushia, Baitarani /BurhaNala	20°-55′-00″	86°-16′-45″
12	L	River Brahmani / Kharsuan river near Tarapur – Rasulpur Block	20°-53′-30″	86°-08′-00″
13	M	River Brahmani / District Boundary Jajpur / dhenkanal (Kantira)	20°-50′-55″	85°-54′-00″
14	N	River Brahmani / AyacutatJajpur	20°-52′-20″	85°-44′-58″

3.2 APPROACH FOR DATA COLLECTION:

Study Period:

According to the terms of reference (ToR), Collection of two season baseline data was recommended. But due to the time constraint, baseline data collection was restricted to one season (Post Monsoon) field survey of relevant Environmental components. However, water samples could be taken during 28th& 29th September 2013, which pertains to the Monsoon season data. Post Monsoon field survey, sampling and data collection resumed from 2nd week of October and continued till end of November 2013.

Approach:

The consultant's team of experts have adhered to a standard approach for collection of baseline data.

I. Environmental reconnaissance (ER) of the project area,

Sl	Activities	Period
1.	Visual inspection	10th – 12th September
2.	Interaction with the local people	10th – 12th September
3.	Discussion with the project authority, collection of data from relevant project records performance overview of the completed phases	13th – 16th September

II. The studied parameters include land, water, Air, Soil and their ecology as well as the pre-project Socio–economic status of the people of study area.

III. Sampling stations were strategically located. Soil & Water samples were collected as per recommended procedure. Suitable equipments are used to record Air quality and Noise level at site. Literature and authentic records were consulted to study the Environment & Socio–Economic status concerning the study areas.

IV. Field survey and sampling period:

Sl	Items	Season	Period
1.	Water quality	Monsoon	27th & 28th September 2013
2.	Water quality	Post-Monsoon	8th – 11th October 2013
3.	Soil quality	Post-Monsoon	8th – 11th October 2013
4.	Ambient Air Quality	Post-Monsoon	October - December 2013
5.	Noise level	Post-Monsoon	8th – 11th October 2013
6.	Vibration level	Post-Monsoon	16th November 2013
7.	Natural Environment (Flora & Fauna with specific attention to Elephant)	Post-Monsoon	30th & 31st October and 6th & 7th November 2013
8.	Depth to water level	Post-Monsoon	8th – 11th and 19th & 20th October 2013

V. Methodology adopted for data collection is highlighted wherever necessary.

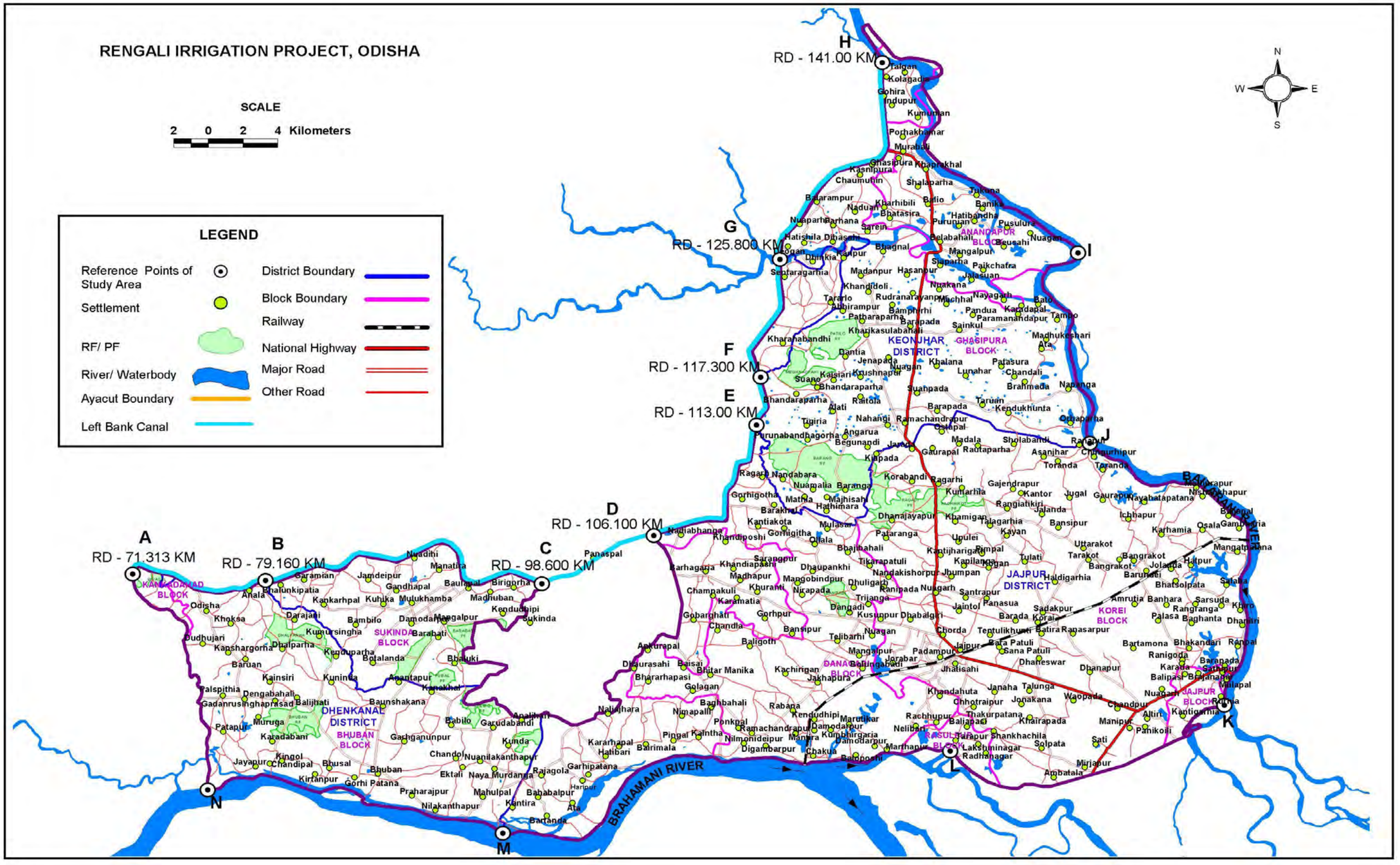


Fig.No.C3-1: Geo-coordinate map of the Study area

3.3 SCOPING MATRIX:

A scoping matrix along with frequency of monitoring proposed for key Environmental attributes are summarized in **Table No.C3-2.**

Table No. C3-2: Environmental Attributes.

Sl. No	Attributes	Parameters for study	Frequency / period	Methodology /source
A – Land Environment				
1	Soil	Soil Characteristics /type	Once / Post monsoon season	• Field studies • Sampling for physical and physico – chemical analysis according to standard laboratory test procedures. • Detailed project report (DPR) and literature view
2	Physiography	Land use – land cover pattern	Pre-project status (Data)	DPR & remote sensing interpretation
3	Geology	Geological status	Pre-project status (Data)	Literature review
4	Seismology	Seismic hazards	Pre-project status (Data)	Literature review
B – Meteorology				
1	Meteorology	Climate conditions precipitation, temperature cloud cover, relative humidity, wind speed, wind direction etc.	Pre-project status using survey data and secondary data	Literature review • IMD Data • Organisation data
C – WATER ENVIRONMENT				
1	Water quality (Surface & Ground Water)	Pollution parameters recommended by CPCB /SPCB, Odisha	Twice- once in Monsoon data and once Post Monsoon data	• Field studies sampling for physical and physic – chemical – biological and bacteriological. Tests & Analysis with reference to CPCB & SPCB standards • Literature review
	Study on Ground water level	Water level in wells	Twice - one Pre-monsoon data & one post-monsoon data.	• Field observation • Literature review

2	Drainage	Land Drainage pattern – impact on natural streams & drains	Pre-project status	• Literature review • Remote sensing interpretation
D – AIR, NOISE & VIBRATION				
1	Ambient air Quality	$PM_{2.5}$, PM_{10}, SO_2, NO_x	Once /post Monsoon	• Field studies sampling • Analysis • Literature
2	Noise levels	Noise levels assessment in dB (A)	Once /post Monsoon	• Field studies • Monitoring
3	Vibration Level	Vibration level assessment in mm/sec	Once / Post monsoon	• Field studies • Analysis
E – BIOLOGICAL ENVIRONMENT				
1	Biological study	Study of Flora - Fauna and Wild Animals (Conservation) Rare and Endangered Species	Once /post Monsoon	• Field studies • Consultation with DFO for local information • Literature review (which covers all seasons)
F – SOCIO–ECONOMIC ASPECTS				
1	• Social status • Socio – economic background	Socio–economic status survey of PAPs and benefited community infrastructure	Once - Pre-project status	• Field studies - Consultation - census data - Project supplied data & literature review

3.4 LAND ENVIRONMENT:

Base line assessment included field survey, sampling, laboratory tests, consultations and literature review of significant Environmental issues which were identified during the process of environmental reconnaissance (ER) and review of earlier studies undertaken for similar activities.

- **Approach:**

  Baseline assessment of land Environment comprises of Physiography, Geology, Seismology and soil characteristics of the study area. The relevant information's and data mostly relates to literature review, thematic interpretation and consultation of statistical records. Field sampling and laboratory testing methods for soil quality parameters were adopted.

- **Study Area:**

  Rengali subproject–II [LBC–II Phase–II] includes continuation of Canal construction works commencing from the already completed chainage 71.313 km and to traverse 69.687 km to reach the tail and at RD 141.00 km which also includes the designed distribution network, covering an ayacut of 72,967 ha. The study area is spread in three districts of the State, namely Dhenkanal, Jajpur and Keonjhar districts.

3.4.1 Physiography:

The study area mostly comprises of hills, valleys and plains. The topography is highly undulating in the hilly regions. The highest elevation of these hills in the study area is 292M above mean sea level (MSL) whereas the lowest elevation in the study area is 20m above mean sea level (MSL). In general; slope of the ayacut area in the western region is W – E and eastern region is N – S. Major Rivers of this area are Brahmani River (W - E), Baitarani River (N – S) and Kusai River (W - E). Physiographically, major part of the study area i.e., the western part lies between two major hills and forms a valley. The hills are Mahagiri RF in the northern side and Ashwakhola RF in the southern part.

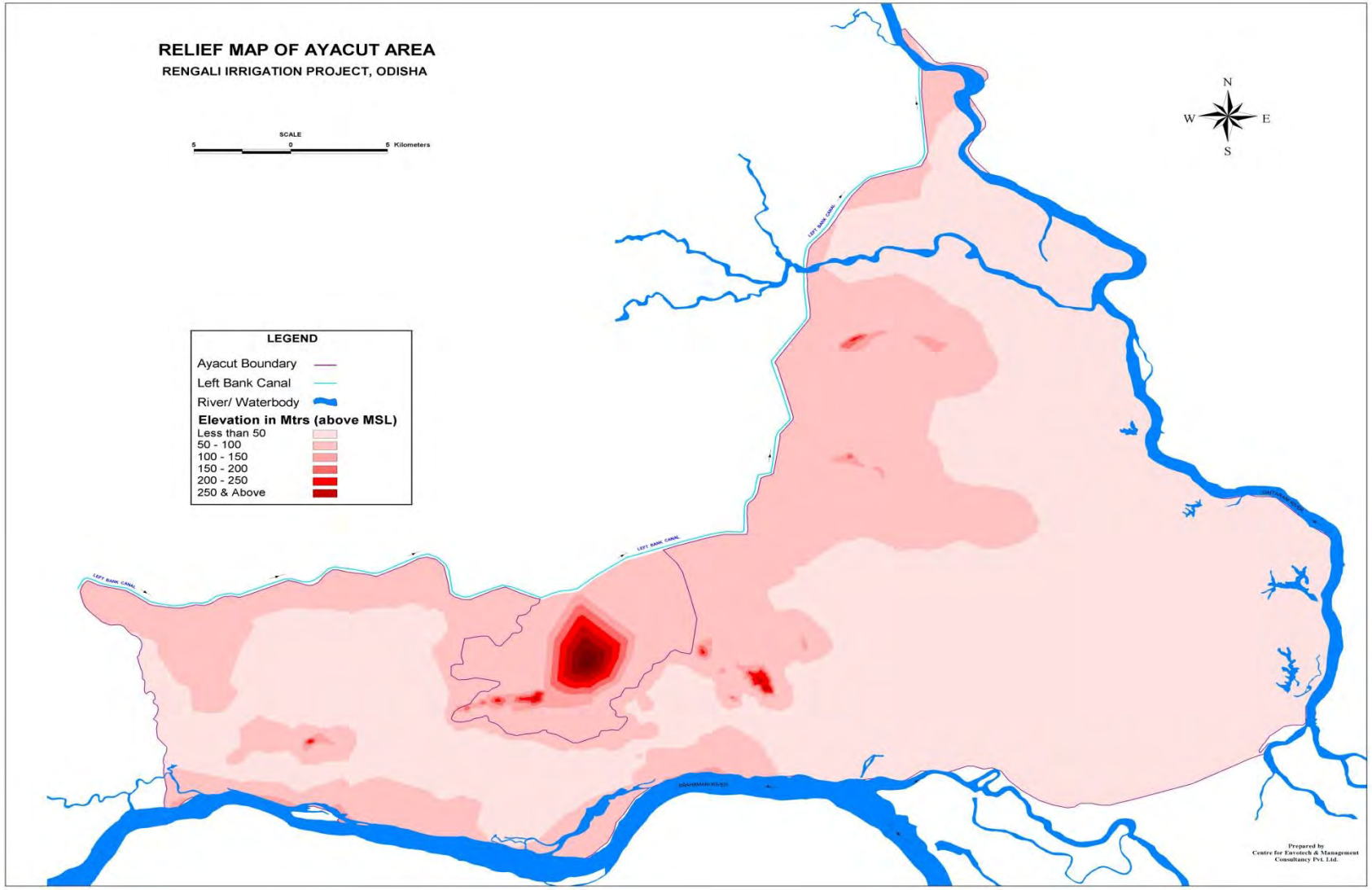


Fig.No.C3-2: Releif map of Ayacut Area

3.4.2 Geology:

The ayacut area comprises of varied lithology ranging from Archaean to recent age. The area is underlained by archaean crystallines mainly of granites and granite gneisses. The occurrence of alluvium and laterites are of recent to sub-recent period. The general geology of the area is furnished in the Fig.No.C3-3. A generalized stratigraphy of the area is given below.

General Stratigraphy:

Recent to Pleistocene	Soil, alluvial sediments, laterites
	Unconfomity
Pre -Cambrian	Dolerite (Intrusive)
	Singhbhum Granite and granite gneiss
	Iron ore group of rocks
	Unconfomity
Archaean	Older Metamorphics and volcanic rocks

Granite and granite gneiss: These are the major litho units occupying vast areas of the study area and limited to central and western part of the ayacut.

Laterites: These litho units occur extensively as patches and exposed in many areas in the western part of the ayacut and occur as capping.

Alluvium: This is the youngest geologic unit of recent age. It consists of gravel, sand, silt and clay. It is developed in the flood plains of the major rivers i.e. Brahmani and Baitarini and their tributaries. The thickness of this alluvium increases towards east and south-East.

Banded Hematite Jasper (BHJ): Banded Hematite Jasper or Banded Hematite Quartzite of iron ore super group are observed in some parts of the project area. BHJ is the parent rock of iron ore bodies. BHJ consist of alternate layers of dark, bluish grey hematite and red colored jasper or chert. The thickness of iron and silica bands varies from less than 0.5 cm to more than 1 mt. Different structures like banding, penecontemporaneous and post depositional structures are found in these rocks. They are very resistant than the surrounding rocks.

Geology of tunnel site i.e. from RD 100.49 km to 103.46 km and Location of areas for minerals contents / minor minerals needs a separate study. However, an approach may be made to Department of Mining and Geology, Govt. of Odisha to carry out the job and provide the report which neednot require any authentification.

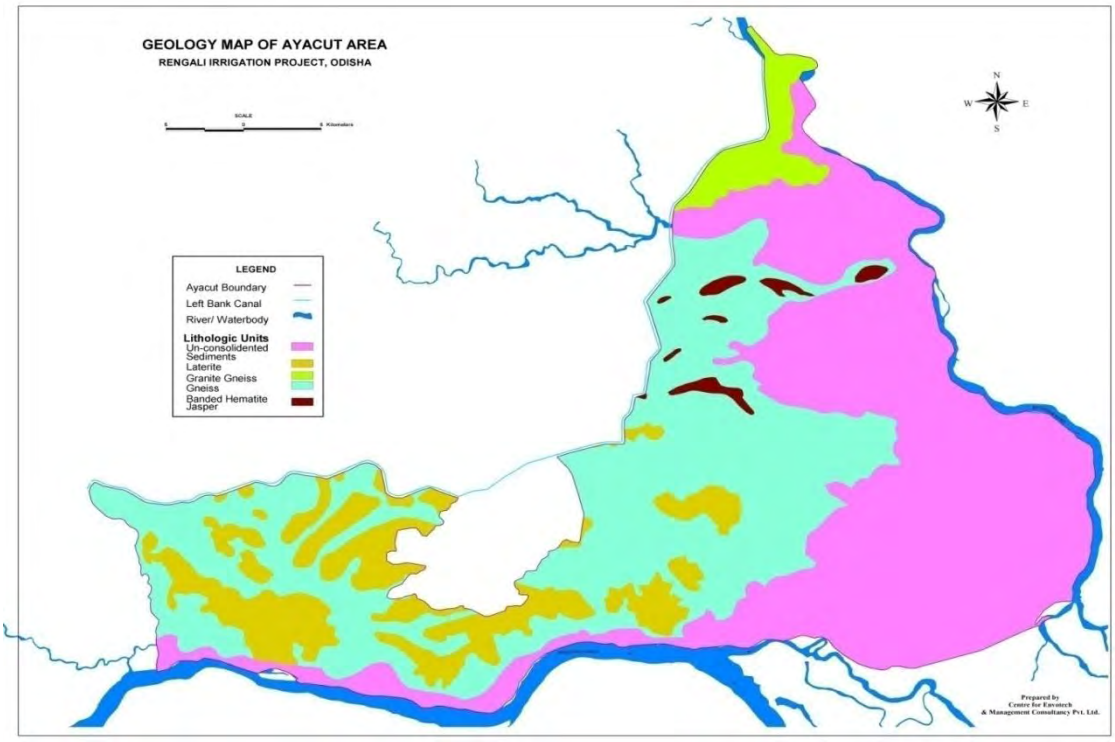


Fig.No.C3-3: Geology map of the ayacut

3.4.3 Seismology:

Seismic zone

Initially the entire Indian landmass, has broadly been divided into 5 different seismic zones namely, zone-I, zone—II, zone-III, Zone-IV and zone-V basing on different levels of earthquake hazard. Subsequently the revision of the seismic zone map given earlier in the vulnerability atlas of India 1997, the seismic zone-I has been merged into seismic zone-II and renamed as zone-II. Recently the **Medvedev–Sponheuer–Karnik scale**, also known as the **MSK** or *MSK-64*, is a macro-seismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence. The project area comes under zone-II & zone-III.

In zone-II, the probable seismic intensity is MSK VI or less. This zone is referred as low damage risk zone. And in zone-III the associated intensity is MSK VII. This is termed as moderate damage risk zone. Seismic Zone map describing seismicity of Odisha is given in **Fig.No.C3-4.**

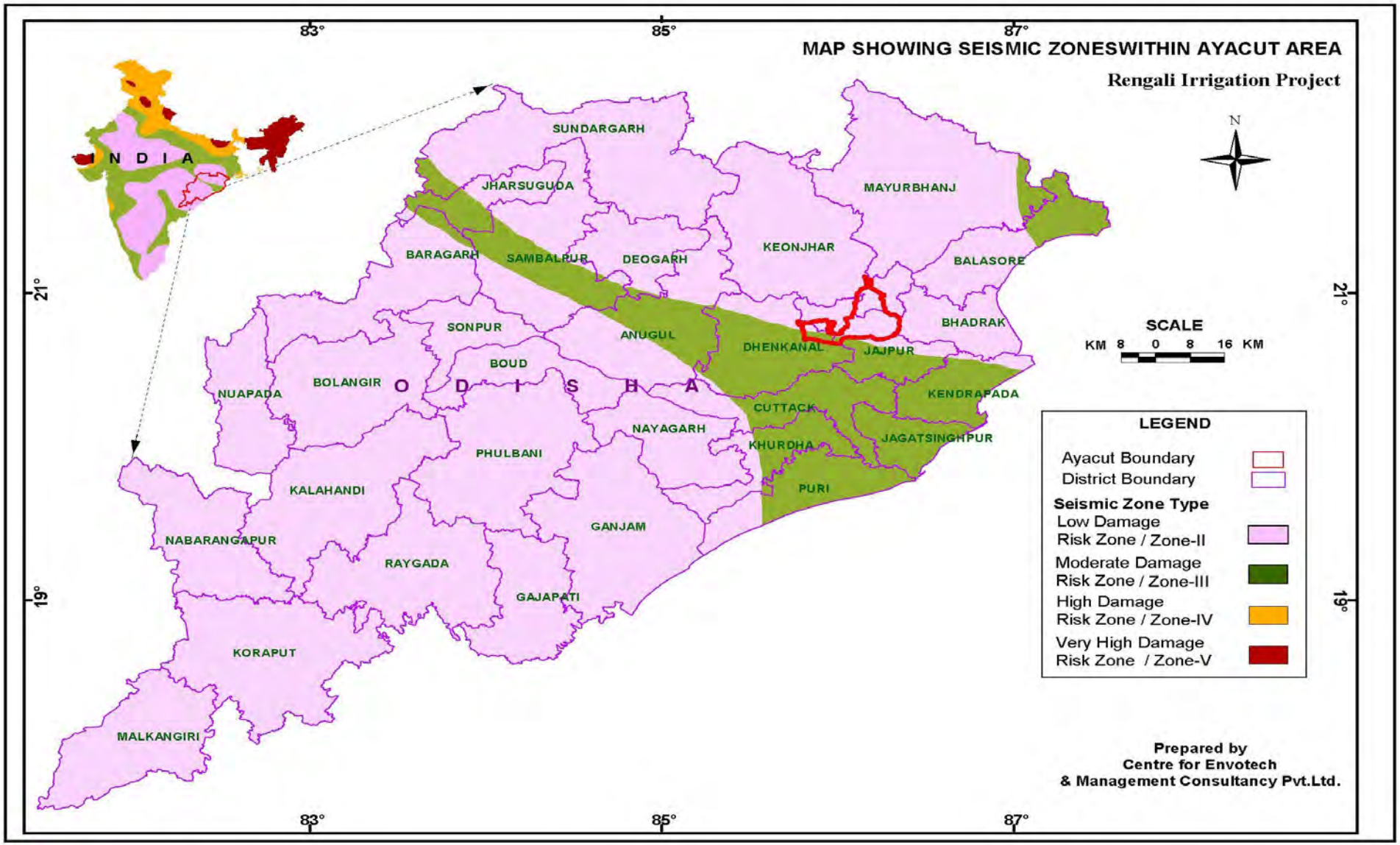


Fig.No.C3-4: Seismic Zoning Map of Odisha

3.4.4 Meteorology:

Meteorology of the study area plays an important role in air pollution studies. The prevailing meteorological conditions at the Project site will regulate the dispersion and the dilution of air pollutants in the atmosphere. The predominant wind speed at the project site will decide the direction and the distance of the most affected area from the proposed activity.

The critical weather elements that influence air pollution are wind speed, wind direction, temperature, which together determines atmosphere stability.

To study the meteorological parameters of the study area data obtained from the nearest IMD stations located at Keonjhar and Cuttack.

The parameters observed from these IMD stations are Temperature, Relative Humidity, Rainfall, Wind Speed and Wind Direction which are reflected in **Table No.C3-3.**

As per the data obtained from the nearest IMD station Keonjhar (1960-1990), average rain fall in this area is 1283.5 mm. Hot summer is felt from March to June and the maximum temperature has been recorded as 47.4^{0}C and minimum temperature is 20.3^{0}C, in rainy season maximum and minimum temperature recorded as 36.4^{0}C - 19.6^{0}C. and in winter season maximum and minimum temperature has been recorded as 33.6^{0}C & 5.8^{0}C respectively. Yearly average wind speed is 1.54 m/s. During study period the predominant wind direction is W. Detailed wind rose diagram is given below:

As per the data obtained from the nearest IMD station Cuttack (1960-1990), average rain fall in this area is 1509.9 mm. Hot summer is felt from March to June and the maximum temperature has been recorded as 47.7^{0}C and minimum temperature is 20.4^{0}C, in rainy season maximum and minimum temperature recorded as 37.3^{0}C & 20.4^{0}C and in winter season maximum and minimum temperature has been recorded as 34.5^{0}C & 7.7^{0}C respectively. Yearly average wind speed is 2.11 m/s. During study period the predominant wind direction is N.

Meteorological data and wind rose diagrams are given in **Table No.C3-3**:

Table No.C3-3: Meteorological data 2013

Sl. No.	Parameters		Cuttack		Keonjhar	
			Sep.	Oct.	Sep.	Oct.
1	Temperature (^{0}C)	Maximum	37.6	36.9	38.9	37.4
		Minimum	22.8	20.1	21.3	16.3
		Average	28.4	23.6	29.5	25.6
2	Relative Humidity	Maximum	81	76	84	78
		Minimum	78	69	83	74
3	Wind speed(m/s)	Maximum	18.5	120*	12.8	120*
		Average	2.3	2.1	3.7	3.1
4	Wind Direction (%)	N	4.1	8.05	4.3	8.8
		NNE	1.2	2.2	3.2	6.1
		NE	2.5	4.9	10.1	10
		ENE	3.6	3.4	1.0	0.9
		E	7.8	9.1	3.6	2.5
		ESE	1.1	1.1	2.3	3.1
		SE	2.6	1.6	7.4	6.8
		SSE	6.8	2.4	1.2	1.1
		S	12.0	4.8	3.4	3.5
		SSW	2.1	0.2	5.6	2.7
		SW	6.7	2.7	13.3	7.1
		WSW	9.5	5.4	5.1	4.5
		W	18	13.9	12	8.7
		WNW	2.1	3.1	3.9	2.2
		NW	4.3	4.5	8.4	7.6
		NNW	1.2	3.2	2.4	3.1
		CALM	14.4	29.45	12.8	21.3
5	Rainfall(mm)	Monthly Total in mm	252.7	131.9	242.2	560.3

***: Natural Disaster (PHAILIN)**

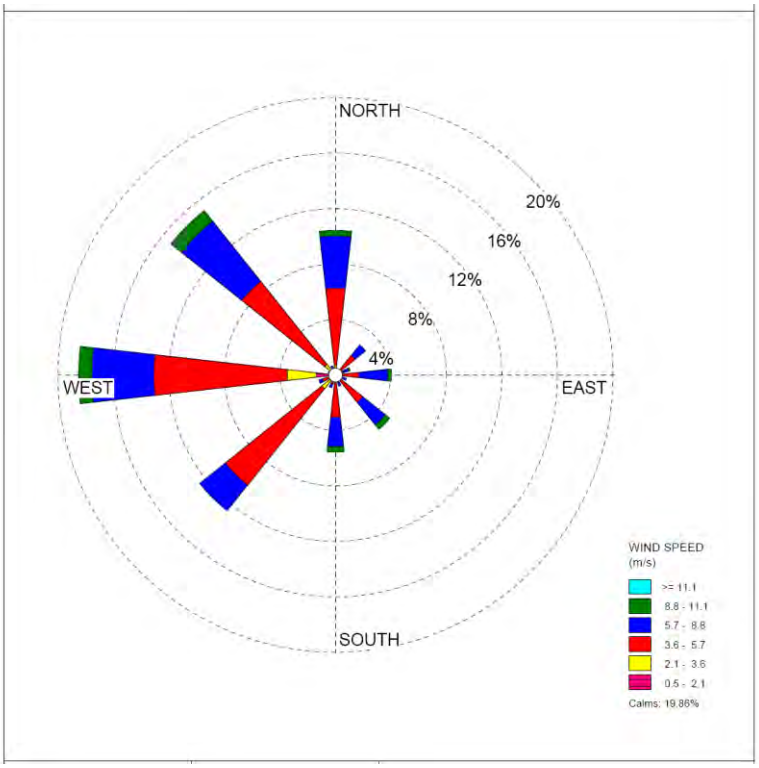


Fig.No.C3-5(A): **Wind Rose Diagram of Keonjhar (SEP 2013**)

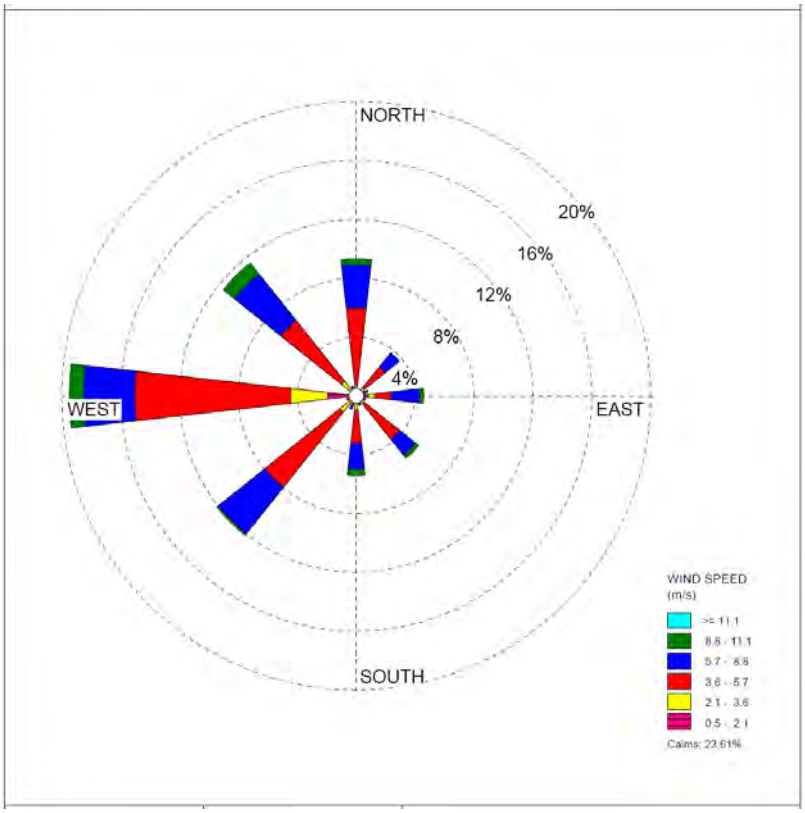


Fig.No.C3-5(B): **Wind Rose Diagram of Keonjhar (OCT 2013**)

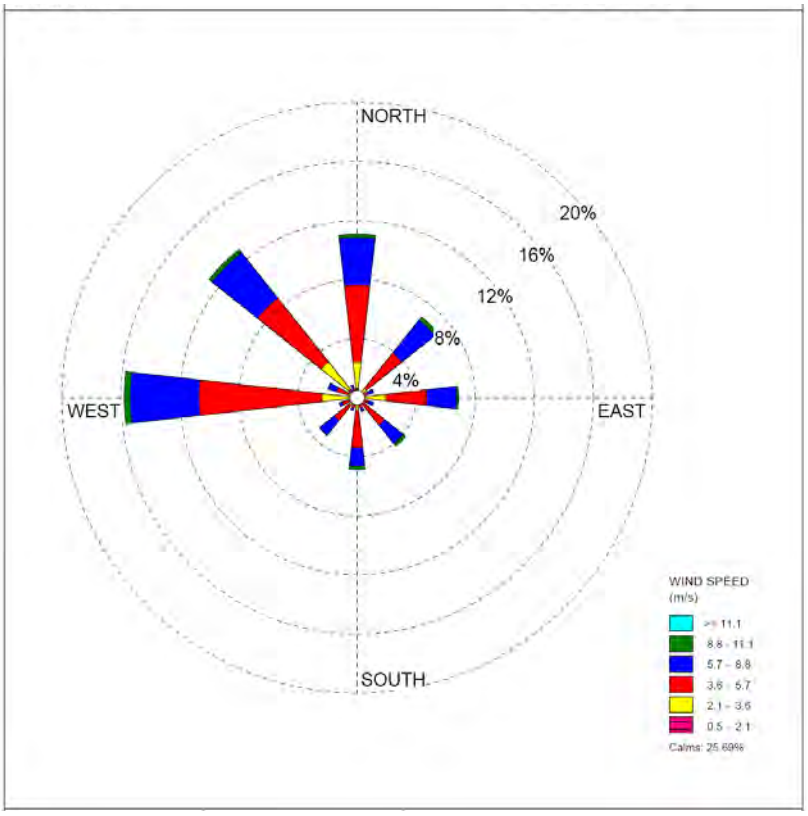


Fig.No.C3-5(C): Wind Rose Diagram of Keonjhar (SEP-OCT 2013)

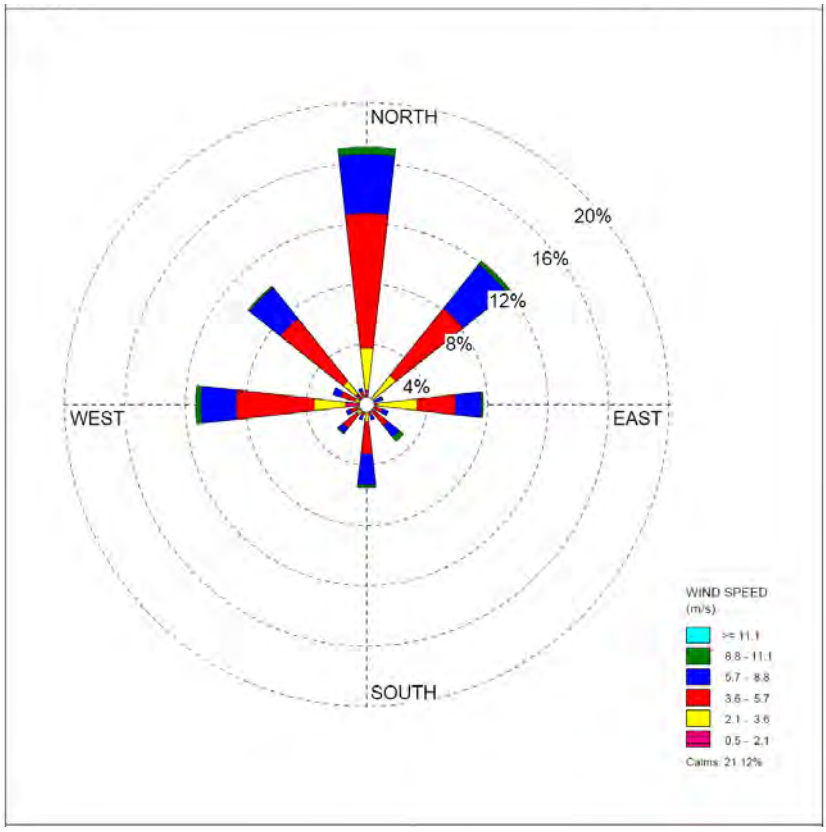


Fig.No.C3-5(D): Wind Rose Diagram of Cuttack (SEP 2013)

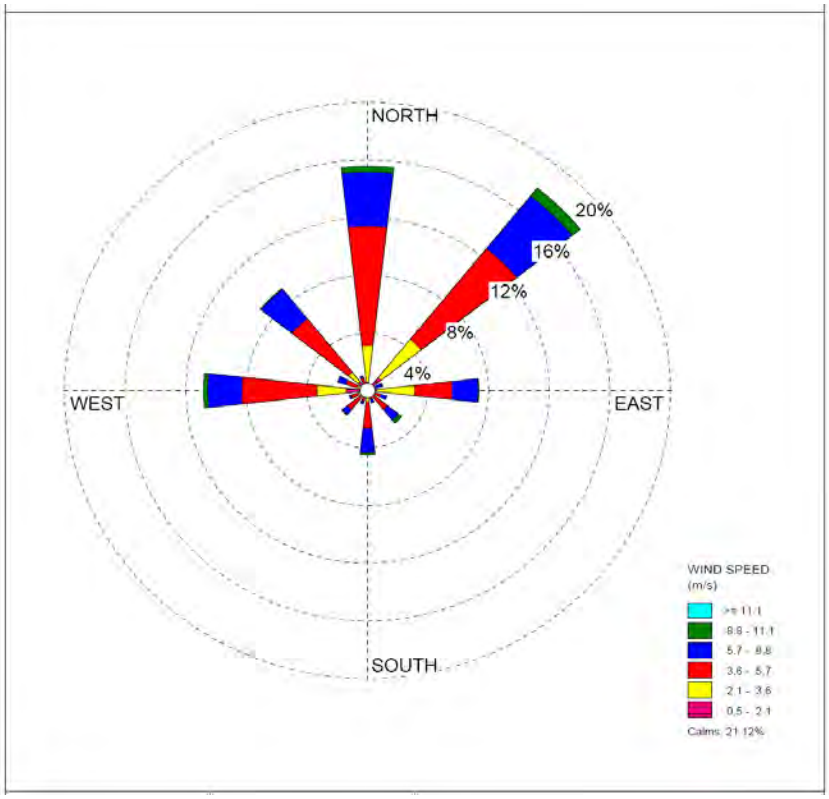


Fig.No.C3-5(E): Wind Rose Diagram of Cuttack (OCT 2013)

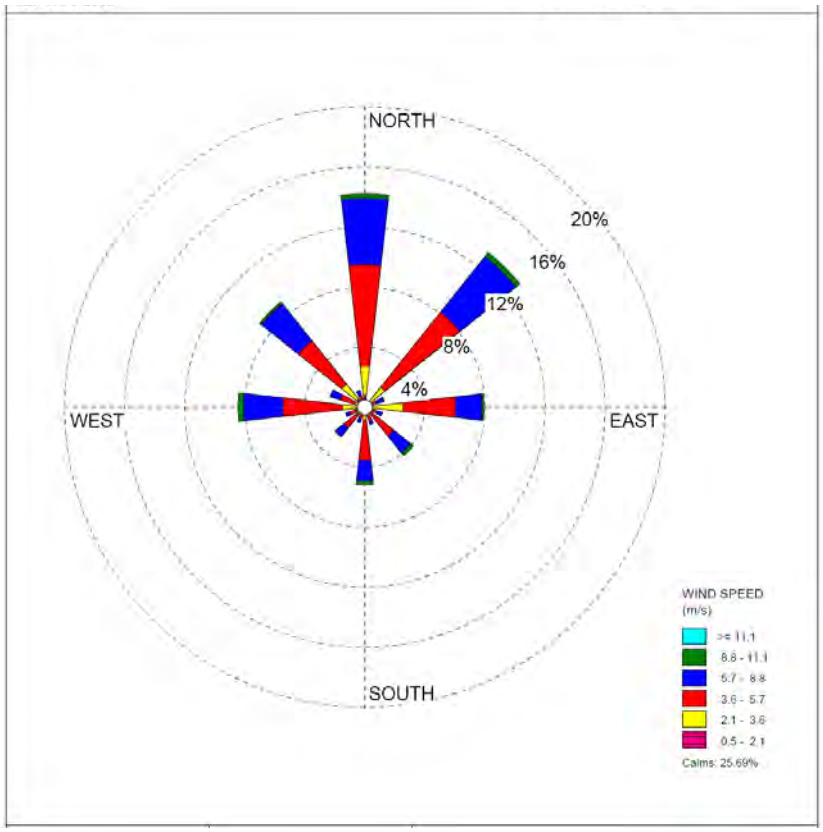


Fig.No.C3-5(F): Wind Rose Diagram of Cuttack (SEP-OCT 2013)

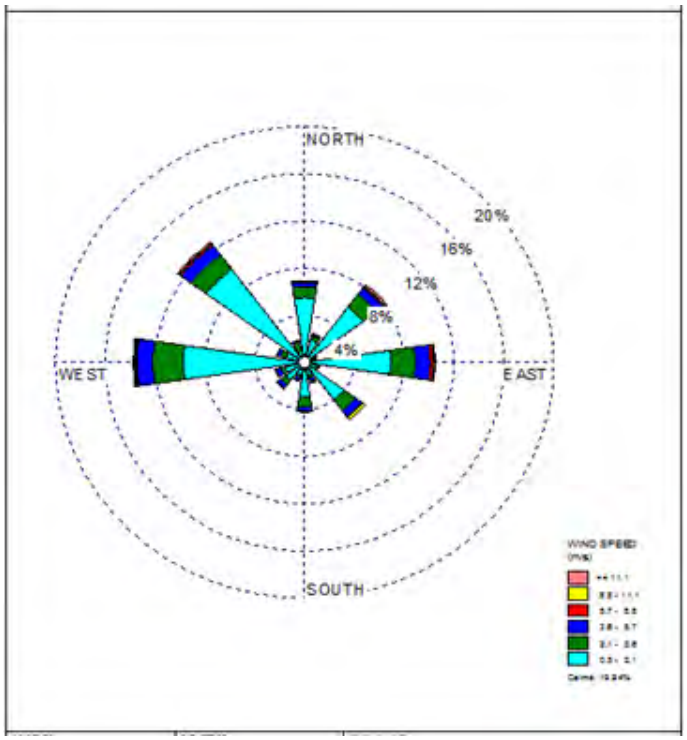


Fig.No. C3-5(G): Yearly Wind Rose Diagram

RAINFALL: The usual rainfall occurs for a period of four months during monsoon. The total rainy day during this four month period is around 55 – 60 days. The South-West monsoon lasts from mid June to mid September and the area receives more than 80% of the annual rainfall during the period. Monthly rainfall data for rainy season of each district of the study area for last 5 years period i.e. from 2008-2012 have been obtained from Hydro-met Division, IMD (Pune) and furnished in **Table No.C3-4A, Table No.C3-4B, Table No.C3-4C.** Comparison of Monsoon Rainfall (2008 to 2012) with Normal Rainfall of these Districts is also graphically presented below**.**

Since rainfed agriculture in Odisha is mostly influenced by statistical distribution of rainfall, number of rainy days in monsoon months, Normal Rainfall data and number of Rainy days have been obtained from IMD data / Agricultural statistics Records of Directorate of Agriculture & Food production, Odisha and furnished in **Table No.C3-4**

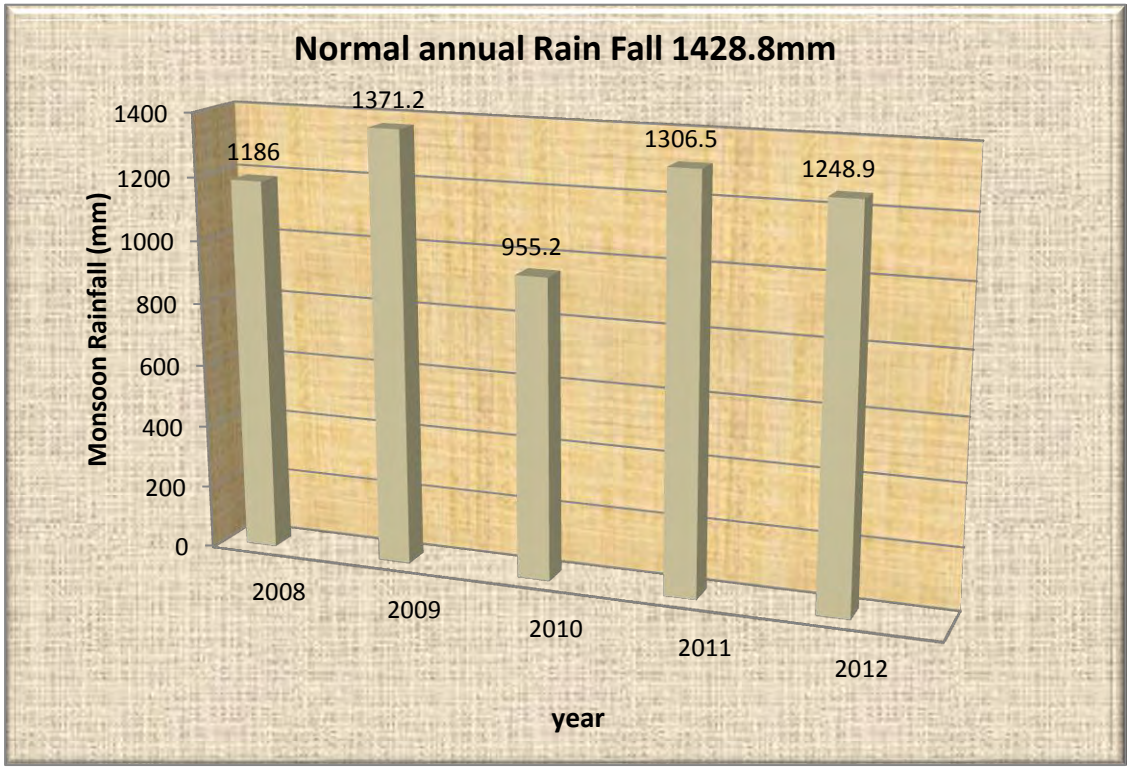
Table No.C3-4: District Wise Normal Rain Fall and Monthly Normal Rainy Days

Name of Districts	Rain Fall Pattern	MONTHS IN A NORMAL YEARS												
		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total annual
Dhenkanal	Normal Rainfall	10.5	21.9	33.7	41.3	69.6	225.7	317.9	344.8	220.6	104.4	36.2	2.2	1428.8
	Numbers of Rainy days	0.8	1.3	2.1	2.5	4.6	10.8	15.0	16.0	11.7	5.2	1.5	0.2	71.7
Jajpur	Normal Rainfall	12.9	25.1	28.4	46.1	93.7	238.5	350.9	341.2	238.0	140.2	41.0	3.9	1559.9
	Numbers of Rainy days	0.8	1.5	1.8	2.7	5.3	10.8	15.3	15.1	11.9	6.2	1.5	0.3	73.2
Keonjhar	Normal Rainfall	14.6	33.8	33.1	42.1	94.8	241.4	318.0	343.6	241.1	101.3	20.5	3.4	1487.7
	Numbers of Rainy days	0.9	2.1	2.4	2.8	5.7	11.0	15.5	16.1	12.0	5.1	1.1	0.3	75.0

Source: IMD (Pune) / Odisha Agriculture Statistics Directorate of Agriculture & Food production. Odisha

Table No. C3-4A: Comparison of Monsoon Rainfall (2008 to 2012) with Normal Rainfall in Dhenkanal District

Years	AVERAGE RAIN FALL IN MONSOON MONTHS OF THE YEARS (mm)						1428.8mm
	June	July	Aug	Sept	Oct	Total monsoon rainfall	Remark Status compared to Normal Rainfall
2008	259.9	284.1	329.9	292.9	19.2	1186.0	% deviation =16.99%
2009	52.2	761.9	246.8	146.2	164.1	1371.2	% deviation =4.03%
2010	172.1	223.4	257.9	199.0	102.8	955.2	% deviation =33.14% **Drought year**
2011	282.1	187.4	394.7	396.1	46.2	1306.5	% deviation =8.56%
2012	158.8	347.3	417.0	240.6	85.2	1248.9	% deviation =12.59%

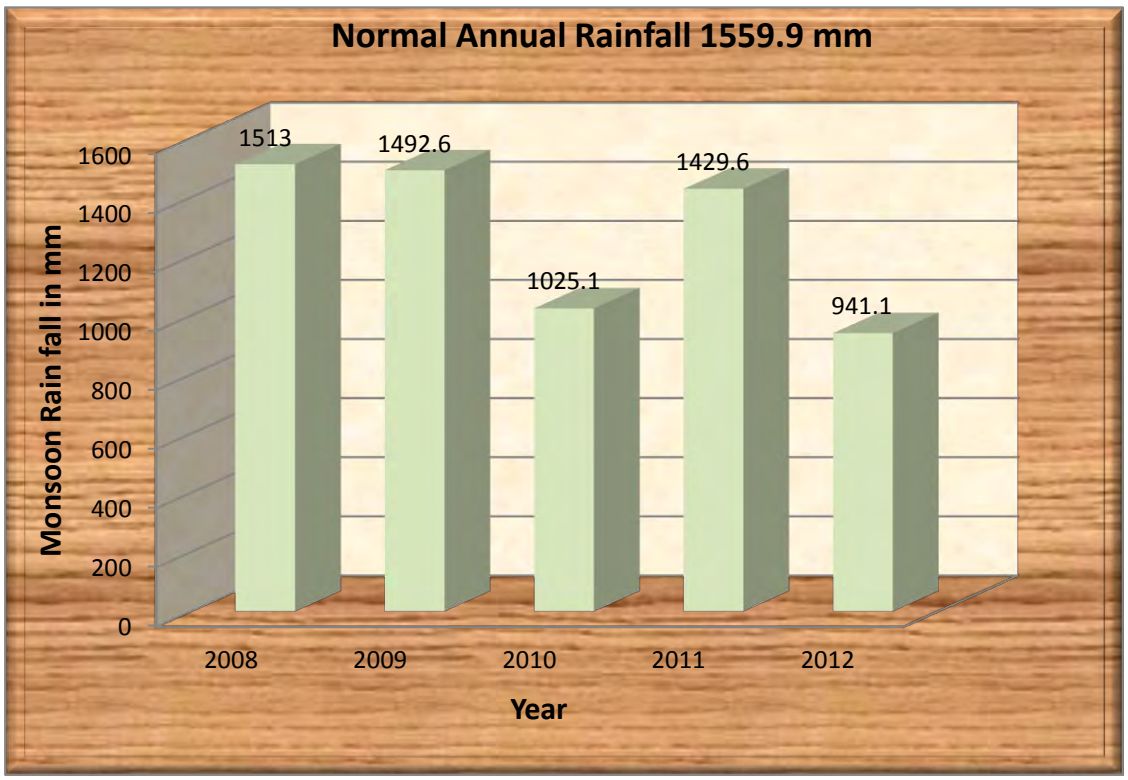


Analytical Overview

- Monsoon rainfalls in all these study years are below the normal annual rainfall of the District.
- Rainfall during 2010 indicates 33.14 % deviation which may be constructed as a Drought year.
- Although total monsoon rainfall in 2009 and 2011 appear reasonable; it is not evenly distributed when compared to number of rainy days those occurred.

Table No. C3-4B: Comparison of Monsoon Rainfall (2008 - 2012) with Normal Rainfall In Jajpur District

Years	AVERAGE RAIN FALL IN MONSOON MONTHS OF THE YEARS (MM)						Normal rainfall= 1559.9mm
	June	July	Aug	Sept	Oct	Total monsoon rainfall	Remark Compared to Normal Rain fall
2008	430.7	233.3	254.7	570.0	24.3	1513.0	% deviation =3.0%
2009	78.9	557.9	414.3	235.3	206.2	1492.6	% deviation =4.31%
2010	208.9	145.5	279.4	212.3	179.0	1025.1	% deviation =34.28% **Drought year**
2011	504.2	151.9	469.5	337.5	16.5	1479.6	% deviation =5.15%
2012	83.0	311.4	287.3	156.9	102.5	941.1	% deviation =39.67% **Drought year**

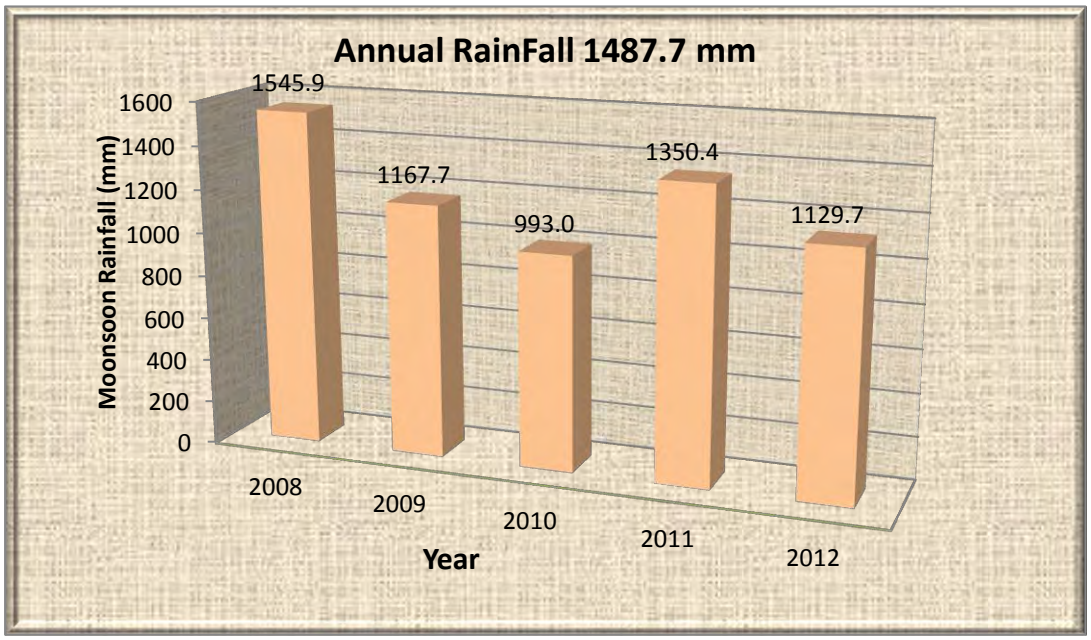


Analytical Overview

- Monsoon rainfalls in all these study years are below the normal annual rainfall of the District.
- Rainfall during 2010 and 2012 indicates 34.28% and 39.67% deviation respectively which may be considered as a Drought year.
- Although total monsoon rainfall in other years appears to be nearly equal; it is not evenly distributed when compared to number of rainy days those occurred.

Table No. C3-4C: Comparison of Monsoon Rainfall (2008-2012) with Normal Rainfall In Keonjhar District

Years	AVERAGE RAIN FALL IN MONSOON MONTHS OF THE YEARS (mm)						Normal rainfall= 1487.7mm
	June	July	Aug	Sept	Oct	Total monsoon rainfall	Remark Compared to Normal Rain fall
2008	570.8	303.6	293.4	362.7	15.4	1545.9	Good year
2009	84.4	461.2	307.9	151.3	162.9	1167.7	% deviation =21.51%
2010	152.7	251.2	255.5	226.3	108.1	993.0	% deviation =33.25% **Drought year**
2011	299.9	226.8	297.9	486.8	39.0	1350.4	% deviation =9.23%
2012	160.6	233.3	382.2	275.5	78.1	1129.7	% deviation =24.06%



Analytical Overview

- Monsoon rainfalls in all these study years are below the normal annual rainfall of the District except that of 2008 where the monsoon rainfall is somewhat more than the normal. So that year may be considered as a good rainy year.

- Rainfall during 2010 indicates 33.25 % deviation which may be constructed as a Drought year.

3.4.5 Land Use & Land Cover Pattern:

The impact of Water Resources projects on land is direct function of the use to which the existing land pattern may be subjected. As Land use refers to "man's activity and the various uses which are carried on land" and Land cover refers to "natural vegetation, water bodies, rock/soil, artificial cover and others resulting due to land transformation", the ayacut area is also consisting of different types of lands. The Land use/Land cover map of the study area is prepared based on the satellite imagery as well as secondary information along with limited field survey. The satellite imagery map (IRS ID LISS III December 2003) showing the present Land use and Land cover in the study area is furnished in **Fig.No.C3-6.**

Since the area is bounded by rivers and canals almost 80% of the total land is agricultural land. And the other 20% land is combination of forest land, water bodies, waste lands and land used in settlements. Land with or without scrub or the degraded forest lands are mostly seen in the western and northern part of the ayacut area. In the northern, central and western part of the project area some forest patches are found, which are mostly scrub forests and dense forest coverage is very less. Maximum no of habitations are found in the central & eastern part of the project area. The details about the land categories are given below.

Settlement: It is defined as an area of human habitation developed due to non-agricultural use and that which has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant lands. The rural settlements are mostly associated with vegetation cover and smaller in size.

Agricultural Land: It is defined as the land primarily used for farming and for production of food, fiber, and other commercial and horticultural crops.

Dense forest: It is an area bearing an association pre-dominantly of trees and other vegetation types capable of producing timber and other forest produce with more than 40% canopy cover.

Open forest: Forests where the vegetative (crown) density is within 10 to 40% of the canopy cover are classified under this category.

Scrub forest: Forests where the vegetative (crown) density is less than 10% of the canopy cover are classified under this category. It is the result of both biotic and abiotic influences.

Land with/ without Scrub: These lands occupy (relatively) higher topography like uplands or high grounds with/without any scrub cover. These lands are more prone to degradation or erosion.

Plantation: These are the areas associated with degraded forest land where plantation has been made to regenerate the forest or areas where orchards/horticulture has been developed. These areas are characterized by regular shape.

Waste Land: These lands are generally uplands without any vegetation or agriculture.

Water Bodies: These are natural or artificial occurrences of water in form of river, ponds and reservoirs. They may be perennial or non-perennial in nature.

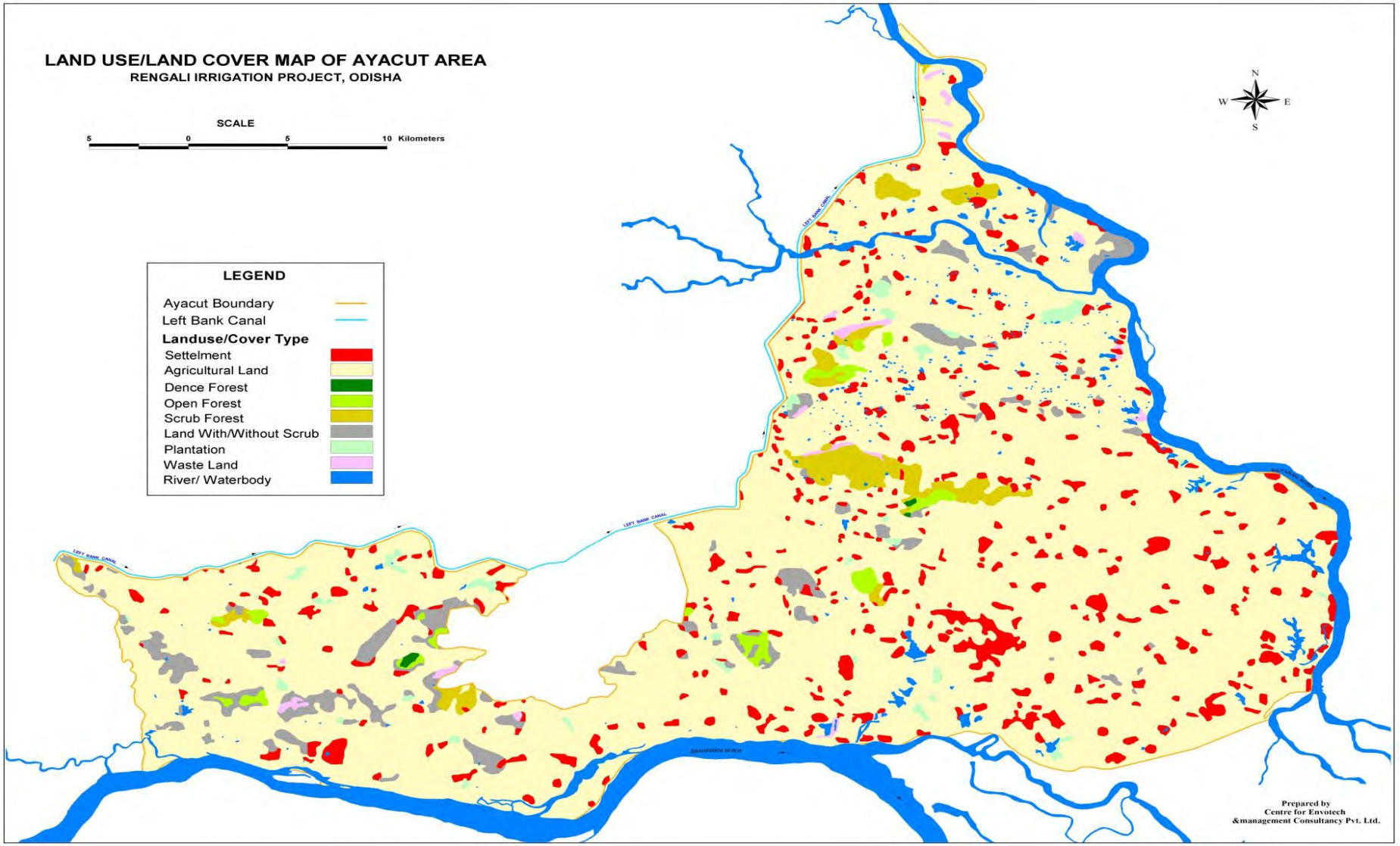
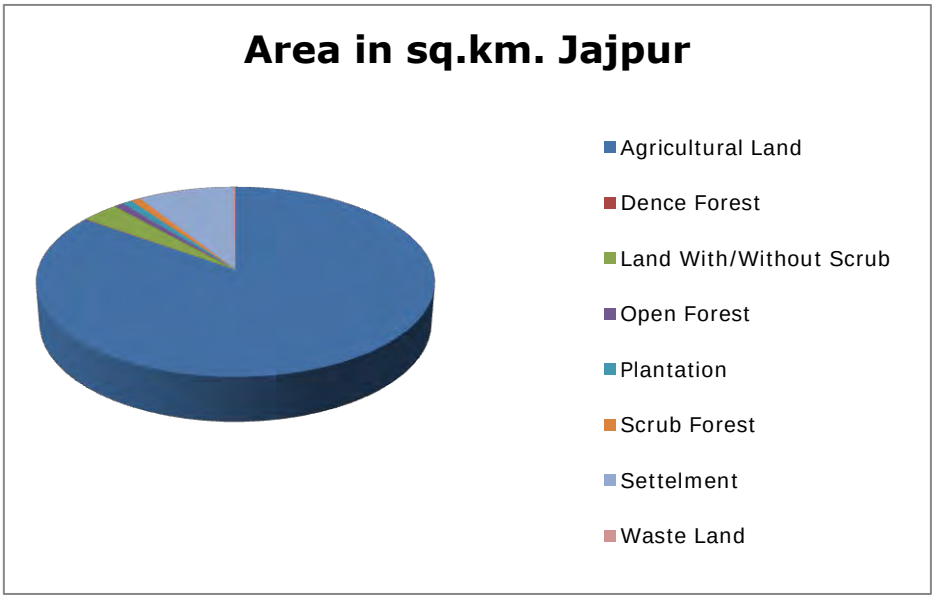


Fig.No.C3-6: Land Use Map of the Ayacut area.

District-Wise Land Use / Land Cover Pattern of the Study Area

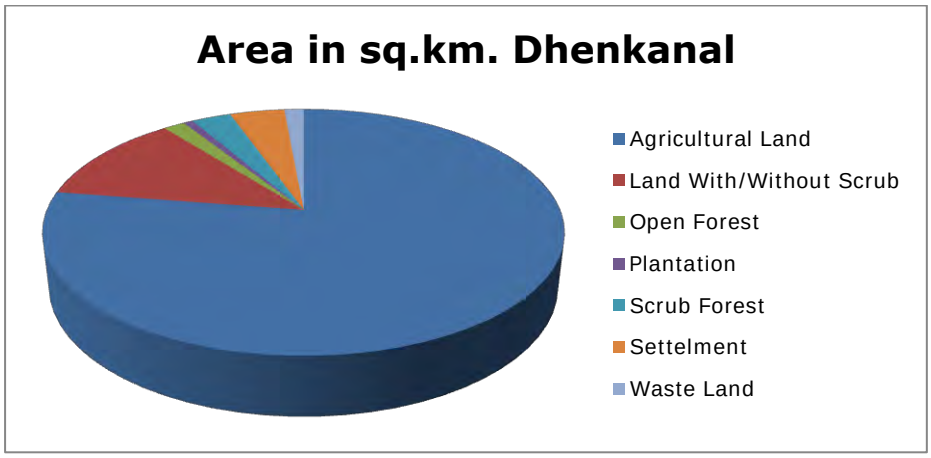
JAJPUR		
Land use Pattern	**Area in sq.km.**	**Percentage**
Agricultural Land	630.72	84.75
Dense Forest	0.72	0.10
Land With/Without Scrub	25.85	3.47
Open Forest	6.50	0.87
Plantation	6.77	0.91
Scrub Forest	6.59	0.89
Settlement	65.35	8.78
Waste Land	1.73	0.23
Total	744.23	100

Pie Chart showing Land use / Land cover pattern of Ayacut area of Jajpur District.



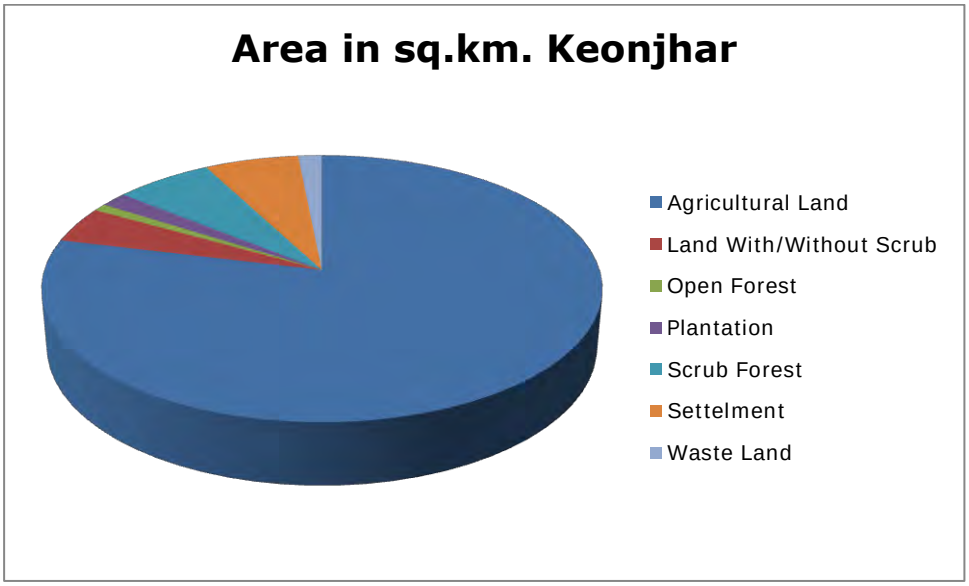
DHENKANAL		
Land use Pattern	**Area in sq.km.**	**Percentage**
Agricultural Land	130.87	77.45
Land With/Without Scrub	20.10	11.90
Open Forest	2.67	1.58
Plantation	1.20	0.71
Scrub Forest	4.90	2.90
Settlement	6.81	4.03
Waste Land	2.43	1.44
Total	168.98	100

Pie Chart showing Land use / Land cover pattern of Ayacut area of Dhenkanal District



KEONJHAR		
Land use Pattern	**Area in sq.km.**	**Percentage**
Agricultural Land	205.34	78.77
Land With/Without Scrub	11.35	4.35
Open Forest	2.35	0.90
Plantation	4.57	1.75
Scrub Forest	16.82	6.45
Settlement	16.21	6.22
Waste Land	4.05	1.55
Total	260.69	100

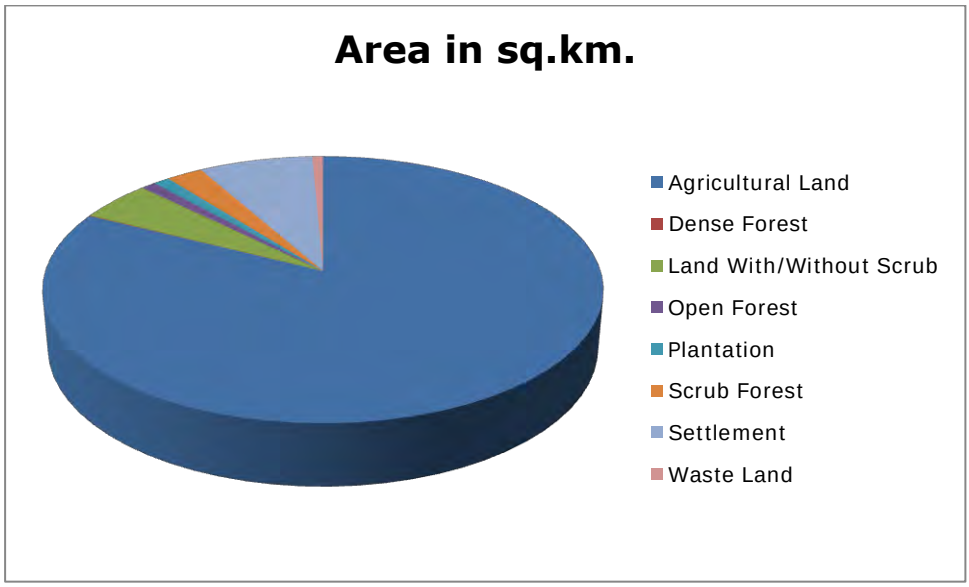
Pie Chart showing Land use / Land cover pattern of Keonjhar District



Land use / Land cover pattern of the Ayacut area

Ayacut Area	
Land use Pattern	**Area in sq.km.**
Agricultural Land	966.93
Dense Forest	0.72
Land With/Without Scrub	57.30
Open Forest	11.52
Plantation	12.54
Scrub Forest	28.31
Settlement	88.37
Waste Land	8.21
Total	1173.90

Pie Chart showing Land use / Land cover pattern of Ayacut Area



3.5 SOIL:

Soil in the present context, is the most important medium for supporting agricultural development in the command area of Left Bank Canal. Its properties influence fertility, water retention capacity, gas exchange ability and physical support capacity of plant roots, determination of various other chemical constituent parameters in command area. It is thus a vital necessity to study the nutrient status of soil regime for designing the cropping pattern. The following activities will have to be undertaken for assessment of soil quality / soil properties.

3.5.1 Methodology:

For studying the soil profile of the region nine soil sampling stations were selected to assess the existing soil conditions in and around the project area. Soil samples were collected during the study period and its physical and chemical properties were analyzed.

Soil samples were collected during 8th - 11th October 2013 from selected locations in the study area to assess the existing soil conditions in and around the ayacut area. This will establish the baseline characteristics and will facilitate in the identification of the incremental concentrations from the proposed activities at a later stage. The baseline characteristics which are analyzed now takes into consideration the effect on soil due to the existing agricultural activities and other anthropogenic activities in the study area.



Collection of soil sample on 08.10.2013

Thus the sampling locations are decided based on one or more criteria listed below:

- To determine the existing soil characteristics of the study area.
- To determine the impact on soil characteristics due to the various activities in the study area.
- To determine the impact on agricultural productivity of soil.

Table No.C3-5: Details of Soil Sample Monitoring Locations

Code	Location	Type of Area	Distance from Nearest Main Canal in km	Direction With respect to Nearest Main Canal
S-1	Ghasipura	Unirrigated	0.94	S
S-2	Laxminagar	Barren	20.5	S
S-3	Garudabandi	Unirrigated	9.01	S
S-4	Damdarpur	Irrigated & Agriculture	13.65	S
S-5	Korda	Agriculture	26.49	SE
S-6	Gohira	Barren	0.18	E
S-7	Panaspal	Unirrigated	0.10	N
S-8	Kansargoda	Unirrigated	3.75	S
S-9	Belabahali	Unirrigated	7.48	S

3.5.2 Soil Sampling Locations:

For studying the existing soil quality status of the study area nine soil sampling locations (Ghasipura, Laxminagar, Gurudabandhi, Damadarpur, Korada, Gohira Panspal, Kansariguda and Belbahali) were selected in and around the project area. A detail of the soil sampling locations is presented in **Table No.C3-5 & Fig.No**.**C3-7**. Soil samples were collected from each of the sampling locations to analyse the physico-chemical properties. This will establish the baseline characteristics and will facilitate in the identification of the incremental concentrations from the proposed activities at a later stage. The baseline characteristics which are analyzed now include the impact on soil due to the existing agricultural activities and other anthropogenic activities in the study area.

Thus the sampling locations are decided based on one or more objectives listed below:

- To determine the existing soil characteristics of the study area.
- To determine the impact on soil characteristics due to the various activities in the study area.
- To determine the impact on agricultural productivity of soil.

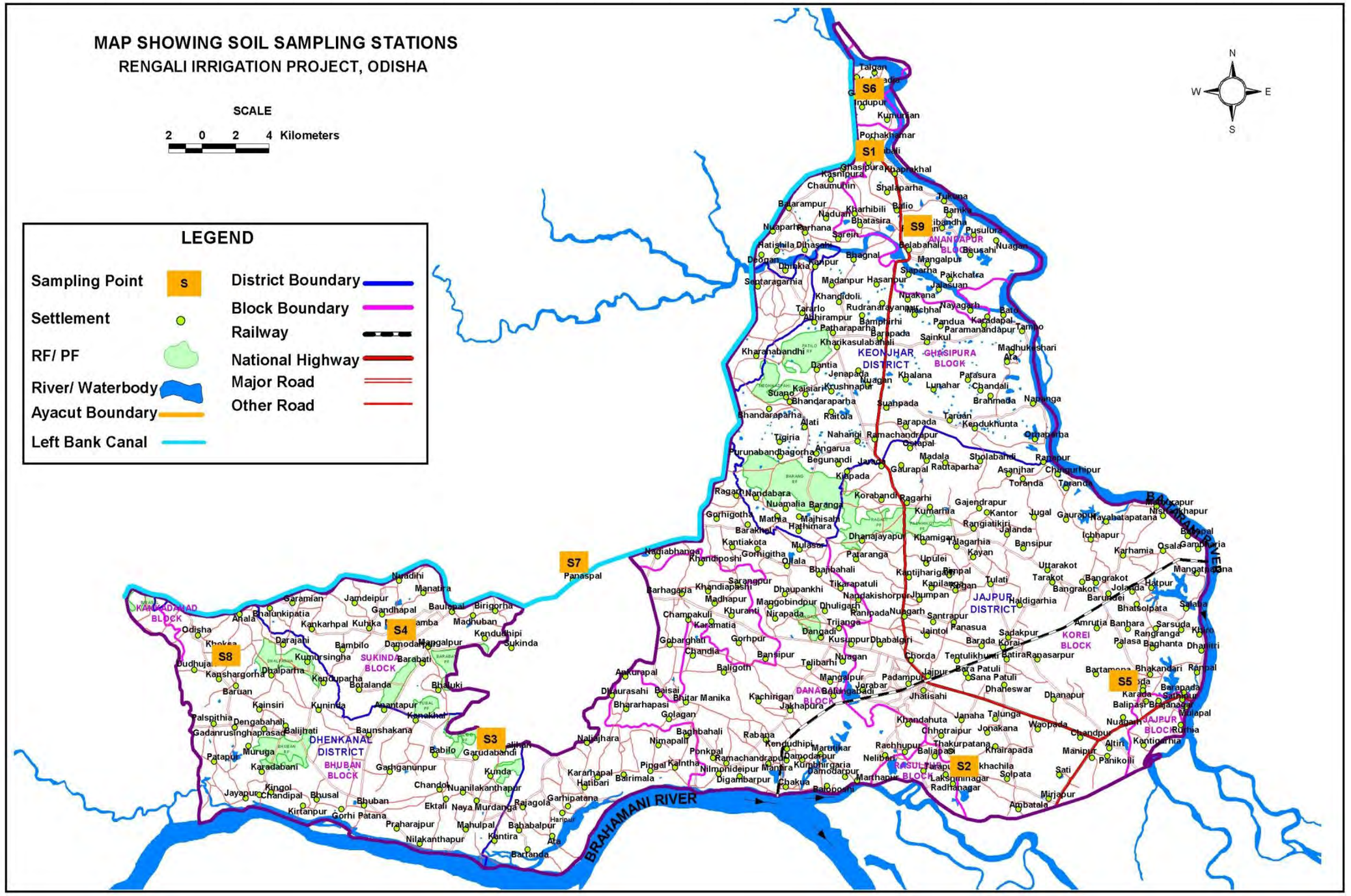


Fig.No.C3-7: Soil Monitoring Location Map

3.5.3 Soil sampling:

From each location soil samples were collected at a depth of 15 cm using a 2.5 cm diameter soil auger. Soil samples were mixed and homogenized. After removing recognizable stones, plant and animal debris, composite samples was air-dried and sieved through a 2 mm mesh sieve before analysis and kept in sealed containers at 4°C before analysis following Fang (2007). Then, soils were subjected to physical and chemical analyses.

3.5.4 Soil characteristics:

Various physico-chemical parameters of soil samples collected from different locations of the study area were analyzed to determine the soil nutrient status. pH was measured with a pH meter. Electrical conductivity (EC) (µmho/cm) at 25^{o}C was determined in soil extract by using EC- meter (Hesse, 1972). Organic matter and total nitrogen were estimated using Walkely and Black and Micro-kjeldahl methods, respectively as mentioned in Rowell (1996). Estimation of available phosphorus was done according to the Olsen's method, Calcium and Magnesium by Versene method. Flame photometer was used for estimation of sodium and potassium (Rowell, 1996). The moisture content of soil was determined on dry weight basis as per Hoque et al. (2008) and bulk density of soil samples was determined as per Misra (1968).

3.5.5 Discussion:

Plants are capable of absorbing and assimilating as many as forty or fifty different chemical elements. Sixteen of these chemical elements have been found to be essential to the growth of most plants. Knowledge of the physical and chemical characteristics of soil is essential to the successful growth of all plant life. Thus soils are tested to determine if essential plant nutrients are present in it or not for raising the desired plants.

Bulk density:

Bulk density is an indicator of soil compaction and soil health. It affects infiltration, rooting depth, available water capacity, soil porosity, plant nutrient availability, and soil microorganism activity. It also influences key soil processes and productivity. It is generally the weight of dry soil per unit of volume typically expressed in g/cm^3. The higher the bulk density the less pore space a soil has. Typical bulk density values depend on the soil materials and conditions. As Bulk density reaches 1.55 to 1.6 g/cm^3, restriction of root growth starts and at about 1.8 g/cm^3 root penetration is inhibited. In the present study the bulk density of soil samples collected from different locations of the study area ranged between 1.16 and 1.45 g/cm^3 and hence considered ideal for growth of plant roots (**Table No. C3-5**).

Moisture content (%):

The percentage of moisture content of different locations of the study area ranged from 6.76 to 25.7 (**Table No. C3-6**). Highest moisture percentage was observed at Panspal while the lowest was observed at Damadarpur. All other locations of the study area exhibited intermediate range of soil moisture content. Soil moisture content is having a major contribution towards maintaining the soil nutrient status and also one of the important factors affecting nitrification. In water logged areas soil suppresses the process of nitrification because of deficient oxygen. Range of moisture content in terms of percentage noticed in the present investigation period at different locations of the study area is suitable for the activity of soil microbes and in the process of nitrification.

pH:

The pH indicates the acidity or alkalinity (basic) of the soil. Different plants have differing optimum soil pH requirements. The majority of plants prefer a pH of around 6 to 7, which is very slightly acidic. The soil pH is important in determining the availability of soil minerals. At pH extremes some minerals are "locked up" and cannot be used by the plants, whilst other minerals may become toxic. Soil pH can have an effect on microbial activity in the soil. As for example, the *Rhizobium* bacteria that are associated with the nodulation of legume plants do not survive well in acidic soils. Further pH of soil mainly depends on the soil water ratio. The pH of the soil samples in the study area ranged from 5.5 to 7.2 (**Table No. C3-6**). The results had shown that soil pH of most of the study sites are acidic in nature except Panspal. The soil sample of Panspal had shown pH value above 7 and was slightly alkaline in nature, and this may be due to high amount of leaching which has led to the leach out of exchangeable anions and is considered as slightly alkaline.

Electrical Conductivity:

Electrical conductivity, as the measure of current carrying capacity, gives a clear picture of the amount of soluble salts present in the soil. It plays a major role in the salinity of soils. There is a relation between electrical conductivity and salinity. Lesser the EC value low will be the salinity value of soil and vice-versa. Conductivity of the soil samples of study area varied from 28.9 to 166 µmho/cm (**Table No. C3-6**). The highest EC value (166 µmho/cm) was observed at Ghasipura whereas the lowest EC value (28.9 µmho/cm) was noticed in the soil of Damadarpur. Electrical conductivity values within 250 µmho/cm are considered as normal nature of soil. EC values of soil between 250 to 750 µmho/cm are considered as moderately tolerant for agricultural practices and 750 to 2250

µmho/cm are considered critical for tolerant crops, while EC values more than 2250 µmho/cm are not considered safe for most of the crops. In the present study no samples had crossed 250µmho/cm and come under the normal range (class-I-low salinity level). Thus almost all the soil samples were found to be suitable for agriculture.

Organic Matter:

The term soil organic matter (SOM) has been used in different ways to describe the organic constituents of soil. SOM as all organic materials found in soils irrespective of their origin or state of decomposition (Baldock and Skjemstad, 1999). It has long been recognized as one of the most important components in maintaining soil fertility, soil quality, and agricultural sustainability. Since SOM consists of C, H, O, N, P and S, it is difficult to directly measure the SOM content. Most analytical methods of organic matter generally measure only organic compounds or carbon, and estimate SOM through a conversion factor. Therefore it is only an approximation of the level of once-living or decomposed matter. Soil organic matter is often viewed as the thread that links the biological, chemical and physical properties of a soil. It has been associated with numerous soil functions like nutrient cycling, water retention and drainage, erosion control, disease suppression and pollution remediation, etc. In the present study it was observed that the SOM in terms of percentage varied between 0.138 and 0.724. Highest SOM was noticed at Belabahali and lowest at Damadarpur. Soil samples of nearly equal to half of the locations were in the high level as compared to rating chart of the soil nutrient. Thus the soils of study sites are suitable for agricultural practices.

Total Nitrogen (%):

The total nitrogen in terms of percentage in different locations of study area ranged between 21.7 to 96.9 mg/100g (**Table No. C3-6**). The minimum total nitrogen was found at Korada and maximum at Belbahali. Nitrogen is one among the four primary elements essential for the plant tissues. It is the major component of proteins, nucleic acids and chlorophyll. The atmospheric nitrogen gets trapped in the soil during electro and photo-chemical fixation and also by the action of microorganisms. Soil nitrogen is made available to various groups of plants through a process of mineralization. The total nitrogen in soil exists in both organic and inorganic forms. However, relatively most of the nitrogen content i.e. about 90 per cent is present in soil in the organic form. Organic form of nitrogen content present in the soil is decayed by microbial activity. During this process all the organic nitrogen gets converted to ammonium, nitrates and nitrites. Such

forms of nitrogen are easily taken up by the plants for their various metabolic processes. It also plays a major role in maintaining the fertility of the soil. In the study area most of the soil samples were fertile with high quantity nitrogen content.

Available Phosphorous:

Phosphorus is essential for plant growth. It is a component of adenosine diphosphate (ADP) and adenosine triphosphate (ATP). These two compounds are involved in most significant energy transformation processes in plants. The available phosphorous content of soil in different locations of the study area varied between 0.2 to 15.2 mg/100g (**Table No. C3-6**). The availability of phosphorus to plant roots has a double constraint: the low total phosphorus level in soils and the small percentage of this level that is present in available forms. Furthermore, even when soluble phosphates are added to soil, they are quickly fixed into insoluble forms that in time become quite unavailable to growing plants. In acid soils, the phosphorus is fixed primarily by iron, aluminium and manganese while in alkaline soils, by calcium and magnesium. This fixation greatly reduces the efficiency of phosphate fertilizers so that little of the added phosphorus can be taken up by plants. In time, the fixed phosphorus can build up and can serve as a reserve pool for plant absorption.

In connection to macronutrient required by plants, phosphorus is the second most important macronutrient available in the soil to be used by various plant life forms for different metabolic activities. It is a major component of nucleic acids, phospholipids and many phosphorylated compounds. Similarly, it is also a second most limiting factor often affecting plant growth. Chemically, phosphorus exists in the soil in the form of both organic and inorganic forms. Generally plants are dependent on inorganic phosphorus especially in the form of phosphate ions, whereas organic phosphates are also important sources of phosphorus in almost all types of soils. In comparison to other macronutrients phosphorus is, required in small quantities, but it may be the most likely limiting element in productivity of the plant. Therefore ecologically it is very much significant. In the study area it was observed that soil samples collected from all locations exhibited more phosphorus content. So the soils are productive in terms of phosphorus content and do not need supplementation with phosphatic fertilizer.

Potassium:

The exchangeable K values were found to be in a wide range - ranging between 2.4 to 75.35 mg/100g (**Table No. C3-6**). The minimum potassium value was

noticed in the sample collected from Belbahali while the maximum value (75.35 mg/100g) was noticed at Damadarpur. Potassium plays many essential roles in plants. It is an activator of many enzymes responsible for various metabolic activities like starch synthesis, nitrate reduction, and sugar degradation. Potassium is extremely mobile within the plant and helps regulate the opening and closing of stomata in the leaves and uptake of water by root cells.

Potassium is also essential for photosynthesis, protein synthesis, starch formation, and for the translocation of sugars. This element is important in grain formation, and is absolutely necessary for tuber development. All root crops generally respond to application of potassium. As with phosphorus, if it may be present in large quantities in the soil and yet exert no harmful effect on the crop. Potassium increases crop resistance to certain diseases, and by encouraging strong root and stem systems, helps to prevent the undesirable growth of plants that is sometimes caused by excessive nitrogen. Potassium delays maturity, thereby working against undue ripening influences phosphorous can exert. In general way, potassium exerts a balancing effect on the effects of both nitrogen and phosphorous. Hence it is one of the important macronutrient acts as a multi-nutrient fertilizer. From the observed values of potassium content at different locations of the study area it was observed that the potassium content is more than adequate in relation to what the plants may require.

Sodium:

The sodium content in the study area ranged between 9.32 to 26.96 mg/100g (**Table No. C3-6**). The minimum sodium content 9.32mg/100g was observed at Belabahali and the maximum 26.96mg/100g was observed at Damadarpur. The sodium content in soil identifies the degree to which the exchange complex is saturated with it. It is important to note that sodium has been found partially to take the place of potassium in the nutrition of certain plants. Where there is a deficiency of potassium, native soil sodium or that added in such soil fertilizer as sodium nitrate, may be useful.

Calcium:

The minimum concentration (0.099 meq/100g) of Calcium was found in the soil samples collected from Belabahali, while the maximum concentration (1.6 meq/100g) of calcium was found at Damadarpur. There was a wide variation in the distribution of exchangeable Calcium content in the study area.

Magnesium:

The minimum concentration of Magnesium (0.017 meq/100g) was observed at Belabahali and maximum (0.25 meq/100g) was observed at Damadarpur **(Table No.C3-6**). All other locations exhibited intermediate range of magnesium concentration in meq/100g.

Sodium Absorption Ratio (SAR):

The Sodium Absorption Ratio ranged between 0.769 and 1.74. A minimum SAR value of 0.769 was found both at Korada and Laxminagar and the maximum SAR value was found at Panspal. All other locations exhibited intermediate range of SAR.

Fertility Status of the Soils:

Based on the results, it is possible to classify nutrient status of the particular area and classify each nutrient level i.e. low, medium or high based on a rating chart as mentioned below in tabular form.

Rating Chart for Soil Test Values and their Nutrient Indices.

Soil pH			
	Acidity	Neutral	Alkaline
Range	Below 60.	6.0 – 8.0	Above 8.0
SRI (Soil Reaction Index)	I	II	III
Electrical Conductivity			
Range(µmhos/ cm)	Normal (<1000)	Critical (1000-2000)	Injurious (>2000)
Salt Index	I	II	III
Organic matter (converted from organic carbon value)			
Range (%)	Low (< 0.29)	Medium (0.29-0.44)	High (>0.44)
Nutrient Index	I	II	III
Available Phosphate			
Range (Kg/ha)	Low (<22)	Medium (22-54)	High (>54)
Nutrient Index	I	II	III
Available Potassium			
Range (Kg/ha)	Low (<123)	Medium (123-296)	High (>296)
Nutrient Index	I	II	III

OM- organic Matter; P- Available phosphorus; K – Available potash

Nutrient index:

From the overall results of physico-chemical analysis of the soil samples, it was noticed that the soil pH values ranges between 5.5 to 7.2 and most of the values belong to soil reaction index II except at Damadarpur and Ghasipura where the soil pH was very close to the value of soil reaction index-I. This indicates that the soils of the study area are under the neutral range. The electrical conductivity of the soil samples were observed to be in the range between 28.9 and 166 µmhos/cm. Based on the rating chart of soil tests, all the soil samples belong to normal level of soil rating chart i.e., salt index I. Organic matter content of soil samples were observed to be in the range between 0.138 and 0.724 percent. As per the nutrient index, the organic matter content of nearly equal to half of soil samples are at higher level. Similarly the potassium and available phosphorus content of soil samples of different locations of the study area are at higher level as compared to soil rating chart.

Soil nutrient index of the study area.

Characteristics	Nutrient Index	Remarks
OM	2.0	Medium
P	2.89	High
K	3.0	High

Nutrient Index	Range	Remarks (OM, P, K)
I	< 1.67	Low
II	1.67 – 2.33	Medium
III	>2.33	High

N.B.:- OM=Organic matter, P=Available Phosphorous, K=Available Potash

Overall results of the physico-chemical parameters of the soil samples, indicated that, the soil is slightly acidic in nature. The electrical conductivity of the soil samples were observed to be in the range between 28.9 and 166 µmho/cm, i.e., salinity of the soils are in low range. Based on the rating chart of soil tests, all the soil samples belong to normal salt content in terms of EC i.e., Salt Index I. Organic matter content of soil samples were observed to range between 0.138 and 0.72 percent. As per the nutrient index, except soil organic matter, values of soil nutrient parameters viz. phosphorus (P) and potassium (K) in soil samples are at high level and needs no application of fertilizer. Overall, results of the soil quality analysis revealed that, it is suitable for cultivation.

Table No. C3-6: Analytical results of soil quality of the study area

Parameters	LOCATIONS								
	Ghasipura	Laxminagar	Garudabandhi	Damadarpur	Korada	Gohira	Panspal	Kansariguda	Belbahali
Phosphorous(mg/100g)	4.6	3.4	0.4	4	3	4.3	0.7	0.2	15.2
Organic Matter (%)	0.52	0.31	0.28	0.14	0.24	0.17	0.55	0.48	0.72
pH	5.6	6.9	6.7	5.5	6.7	6.2	7.2	6.5	6.8
Conductivity(Micro mho/cm)	166	68.6	71.9	28.9	76.9	50.7	99.8	54	63
Moisture (%)	12.8	16.9	20.5	6.76	20.1	14	25.7	12.1	22.8
Bulk density(gm/cc)	1.33	1.25	1.16	1.33	1.16	1.21	1.2	1.4	1.45
Nitrogen (mg/100g)	80.7	66.8	70.7	82.6	21.7	70.7	84.8	88.2	96.9
Ca (meq/100gm)	0.81	0.65	0.455	1.6	0.65	0.455	0.39	1.281	0.0986
Mg (meq/100gm)	0.15	0.1	0.07	0.25	0.1	0.07	0.06	0.21	0.017
Potassium (mg/100g)	35.67	14.02	12.82	75.35	14.02	12.82	13.22	34.86	2.4
Sodium (mg/100g)	19.8	10.83	16.57	26.96	10.83	16.57	18.99	23.89	9.32
SAR	1.24	0.77	1.41	1.22	0.77	1.41	1.74	1.20	1.69

3.6 EXISTENCE OF ARCHAEOLOGICAL SITES AND HISTORICAL MONUMENTS:

An attempt has been taken to identify locations of some of those tourist spots having religious and archaeological significance in the benefited districts.

Table No. C3-7: Religious, Historical & Cultural places in three districts

Districts	Name of some important locations with significance	Distance from the Head Quarter
Dhenkanal	1. Kapilash : Age old Siva Temple	27 km
	2. Joranda : Mahima Ashram	26 km
	3. Kualo : AsthaSambhu Temple	65 km
	4. Dandadhar : Tourist spot	67 km
	5. Tentuliapada : Religious Place	20 km
	6. Jiban Khola : Religious Place	20 km
	7. Sapta Sajya : Tourist spot	15 km
Jajpur	1. Biraja Temple : Age old temple	00 km
	2. Lalitgiri/Ratnagiri : Buddhist Sanctuary	55 km
	3. Mahavinyak : Temple & tourist spot	62 km
	4. Chhatia Bata : Age old temple	78 km
	5. Navigaya : Temple &Culture place	00 km
	6. Dashwas Medha Ghat: Religious& Historical place	00 km
	7. Olasuni Cave : Tourist spot	70 km
Keonjhar	1. Barhatipra : Temple & Culture place	39 km
	2. Bhimakund : Historical place & tourist spot	58 km
	3. San Ghagara : Water fall & Tourist spot	06 km
	4. Bada Ghagara : Water fall & Tourist spot	10 km
	5. Deogaon : Kushaleswar temple, Religious and Cultural place	90 km
	6. Ghatgaon : Tarini temple & Religious place	45 km
	7. Murga Mahadev : Siva Temple	70 km
	8. Asura Khol : Tourist spot	50 km
	9. Gonasika : Tourist spot	45 km
	10. Khandadhar : Tourist spot	60 km

Sources: Literature Consultation, District Statistics Hand Book

3.7 AIR QUALITY:

The objective of the study is to analyze the existing ambient air quality within the study area and compare it with the standards specified by CPCB/SPCB to know about the pollution status of air in and around the ayacut area. To quantify the impact of the construction activities on the ambient air quality at the ayacut and its surrounding area, it is necessary to evaluate the existing ambient air quality in those areas. The existing ambient air quality of the ayacut & its surrounding area was measured from October to Decemcer 2013 and analysed, in terms of Particulate Matter (PM_{10}), Particulate Matter ($PM_{2.5}$), Sulphur-dioxide (SO_2) and Oxides of Nitrogen (NOx). The causes of air pollution in the area will be due to construction activities i.e. excavation, construction and allied work, vehicular movement, dust arising from unpaved village roads and domestic fuel burning. The critical weather elements that influence air pollution are wind speed, wind direction, temperature, which together determines atmospheric stability.

3.7.1 Location of Monitoring Stations:

The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network and was based on following considerations:

- Meteorological condition on synoptic scale.
- Topography of the study area.
- Representatives of regional background air quality for obtaining baseline status.
- Location of residential areas representing different activities.

To assess the ambient air quality level, 9 (Nine) monitoring stations were set up in the study area and their details are presented in **Table No.C3-8**.

Table No.C3-8: Ambient Air Quality (AAQ) Monitoring Stations

Sl. No	Station Code	Location	Distance	Direction	Type of Area
			With respect to Main Canal		
1	A1	Damdarpur	13.65	S	Rural & Residential
2	A2	Panaspal	0.1	N	Near Tunnel construction site. Rural &Residential
3	A3	Laxminagar	20.5	S	Rural & Residential
4	A4	Badapatuli	16.78	S	Residential, Near to Railway line
5	A5	Korda	26.49	SE	Near NH-205, Residential
6	A6	Belabahali	7.48	S	Near NH-205, Residential
7	A7	Ghasipura	0.94	S	Near NH-205, Residential
8	A8	Gohira	0.18	E	Near NH-205, Residential
9	A9	Ragadi	11.05	S	Near NH-205, Residential

3.7.2 Methods of Sampling and Analysis:

The methods of sample collection, equipment used and analytical procedure adopted are presented in **Table No.C3-9**.



Table No.C3-9: Methodology of Sampling & Analysis and Equipment used

Sl. No.	Parameters	Code of practice	Sampler	Instruments for Analysis	Method followed
1.	Particulate Matter-(Size less than 10µm) (PM_{10})	IS: 5182 (Part IV)	HVS with cyclone separator	Balance, Oven, Decicator	Gravimetry
2.	Particulate Matter-(Size less than 2.5µm) ($PM_{2.5}$)	-	HVS with cyclone separator	Balance, Oven, Decicator	Gravimetry
3.	Nitrogen Oxides (NOx)	IS: 5182 (Part XVII)	HVS	Gas Chromatograph with Methaniser	Jacobs and Hochheister modified (Na-arsenite) Method
4.	Sulphur diOxide (SO_2)	IS: 5182 (Part XVII)	HVS	Colorimeter	Improved West &Gaecke method

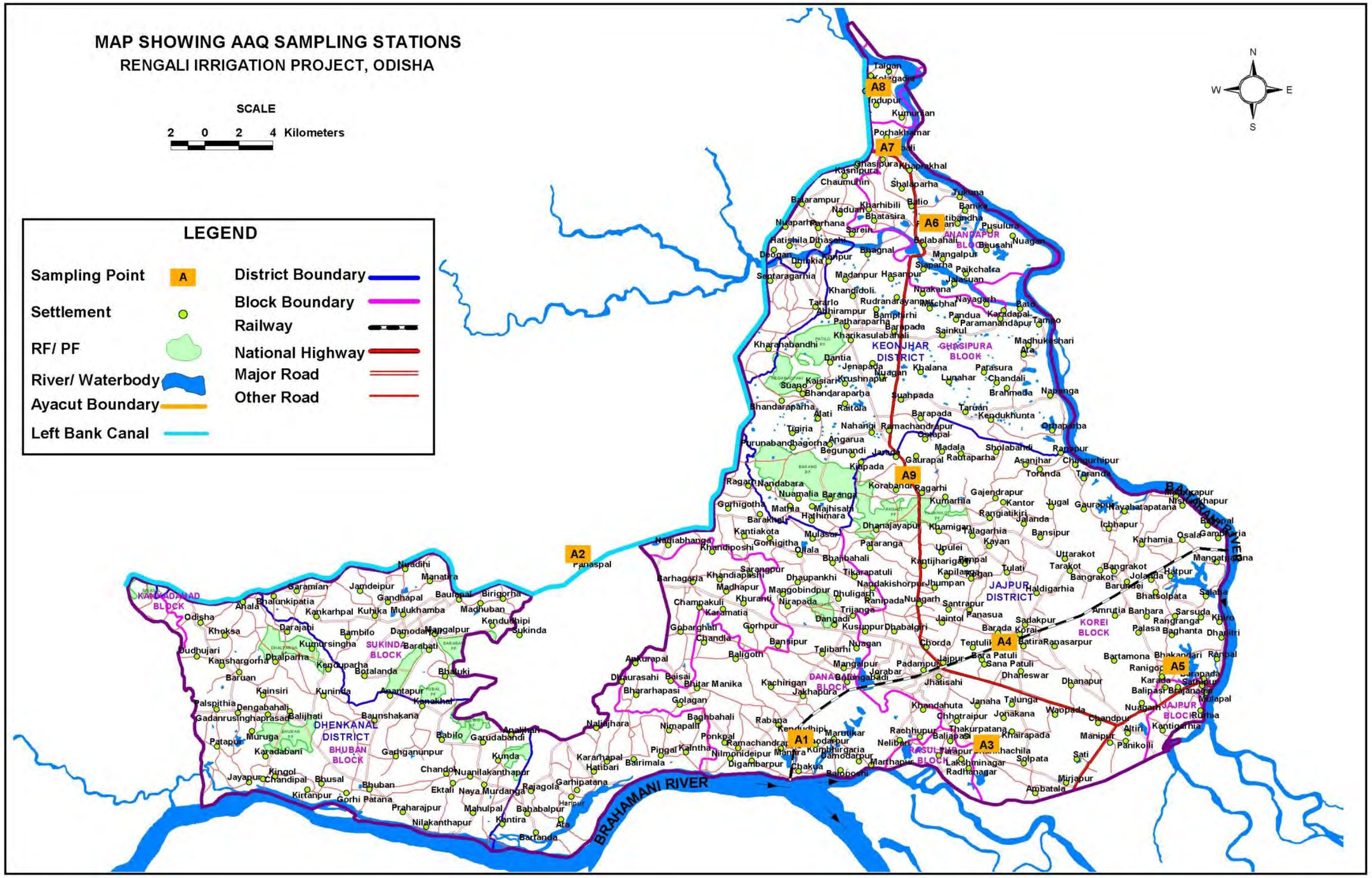


Fig.No.C3-8: AAQ Monitoring Location Map

Table No.C3-10: Summarized ambient air quality analysis data

Code	Sampling station	PM_{10}(µg/ m^3)			$PM_{2.5}$ (µg/ m^3)			SO_2 (µg/ m^3)			NO_X (µg/ m^3)		
		Max	**Min**	98th percentile	**Max**	**Min**	98th percentile	**Max**	**Min**	98th percentile	**Max**	**Min**	98th percentile
A1	Damdarpur	42.2	34.8	40.3	25.3	17.5	21.1	8.5	6.5	8.2	9.3	6.7	8.9
A2	Panaspal	48.5	35.7	45.2	28.8	19.4	23.7	9.1	7.4	8.6	10.3	7.1	9.6
A3	Laxminagar	43.8	36.4	41.5	24.0	17.7	21.4	8.9	6.8	8.4	9.7	6.9	9.2
A4	Badapatuli	37.8	33.9	35.5	23.3	17.1	21.8	7.3	6.2	6.8	8.5	7.1	8.2
A5	Korda	40.1	34.4	39.3	25.6	18.8	23.9	8.2	6.4	7.8	8.8	7.3	8.5
A6	Belabahali	53.7	45.9	51.2	30.7	25.4	28.7	9.5	8.9	9.4	10.3	8.8	9.9
A7	Ghasipura	57.3	46.8	55.2	32.3	26.7	29.5	10.9	8.2	10.2	11.7	9.2	10.8
A8	Gohira	56.7	46.7	53.9	31.9	24.1	27.8	10.5	7.9	10.0	11.3	9.2	10.9
A9	Ragadi	54.6	43.9	52.4	31.1	25.3	26.4	10.2	7.6	9.7	10.8	9.1	10.5
Range		33.9 - 57.3			17.1-32.3			6.2 - 10.9			6.7- 11.7		
NAAQ STANDARD		**100**			**60**			**80**			**80**		

3.7.3 Observations:

Particulate Matter (PM_{10}):

Maximum concentration of PM_{10} of i.e.57.3 $\mu g/m^3$ was recorded at A7 (Ghasipura) location and this is due to the presence of NH-205 and the minimum concentration of 33.9 $\mu g/m^3$ was recorded at A4 sampling station. The 98^{th} percentile values of PM_{10} at all the locations are below the CPCB norms for rural, residential and other areas.

Particulate Matter ($PM_{2.5}$):

The maximum concentration of $PM_{2.5}$ of 32.3 $\mu g/m^3$ was recorded at monitoring station A7 and the minimum concentration of 17.1 $\mu g/m^3$ was recorded at A4. The mean values at all the locations are below the CPCB norms for rural, residential and other areas.

Sulphur Dioxide (SO_2):

The SO_2 analysis data shows, that SO_2 concentration of AAQ ranged from 6.2 to 10.9 $\mu g/m^3$ Maximum SO_2 concentrations was exhibited at site A7 and minimum at several places. In general the range of SO_2 concentration in the AAQ of the study area is within the specified norms of CPCB.

Nitrogen Oxides (NO_x):

The maximum and minimum concentration of NO_X ranged between 6.7 - 11.7 $\mu g/m^3$. In all the sampling location the value of NOX was well within the permissible standard of CPCB.

3.8 WATER ENVIRONMENT:

The study of water Environment basically consists of water resources and its quality which are most desirable for this irrigation project, at its various stages of development. The baseline study dovetailed assessment of sufficiency of water source as per the project designed demand and determination of quality parameters to ascertain best use against water pollution.

3.8.1 Water Resources:

The project envisages supply of water from Samal Barrage pond through well designed canal network for the basic purpose of irrigation and agriculture development.

Construction of a 560.50 m long Barrage structure across river Brahmani near village Samal under the Kaniha block of Angul District constitutes the most

important Irrigation component of Rengali Multipurpose project. Samal Barrage is located 35 km downstream of the Rengali Dam along the Brahmani river course. It is designed to pick up water from the powerhouse release as well as to receive water from the free catchment appearing in between the 35 km stretch.

The pond thus created by the Barrage structure maintains a maximum pond level at EL 76.20 m and minimum pond level at 75.50 m and relates to a live storage capacity of 20.10 Mil.m^3 which is intended for supply of irrigation water through its two major canal systems namely the Right Bank Canal (RBC) Left Bank Canal (LBC) located at either flanks of the Barrage structure. [Salient Features of Samal Barrage is furnished at 2.1 A of Chapter - 2]

- Proposed Irrigation Water Supply from the Barrage pond

Canal	Head Discharge	Ayacut Coverage
LBC	151.864 m^3 / sec	1,14,300 ha
RBC	111.30 m^3 / sec	1,04,092 ha

- Water availability in the pond

  The live storage capacity is 20.10 m m^3 in this dynamic pondage.

3.8.2 Drainage in the Study Area:

3.8.2.1 Basin Features:

The study area comprising of 72.964 ha of ayacut in three districts is well drained by the two major river systems of Odisha, the river Brahmani Flowing W – E direction remains at the southern boundary along with its significant distributary the Khurasuan river forming the part boundary of Jajpur District. The river Baitarani flowing N – SE direction forms the eastern boundary of the study area in Keonjhar Districts along with its significant tributary the Kusei river which intercepts the left Canal.

Nearly 75% of the study area coming under Dhenkanal and Jajpur districts constitutes Brahmani sub basin with a number of streams flowing NW – SE direction / N – S direction which are responsible for effective draining of the area. Similarly some streams tributary to river Kharsuan take care of the drainage of a part of the ayacut in Jajpur districts.

Drainage in the eastern part of the study area in Keonjhar district is controlled mostly by the Kusei river which confluences river Baitarani near village Naradapal.

3.8.2.2 Study of Drainage Pattern:

The broad drainage pattern of the study area was drawn by using the remote sensing imagery maps and toposheet. The drainage map is furnished in **Fig.No.C3-9.** The study area features some significant streams with their secondary and tertiary drains which confluences the major system and become responsible for draining the area effectively. Some of these significant streams with catchment details are described below.

3.8.2.3 Some Significant Streams/ Nallahs in the Study Area:

1. DamsalNadi / GahiraNadi:

- Tributary of river Brahmani which originates from Birasal RF ranges and traverse NW – SE direction.
- The LBC intercepts its course at RD 71.50, where a drainage crossing structure (CD work) has been provided, CD works are also provided in LBC when it crosses some of its secondary drains
- DamsalNadi in its traverse confluences with another stream Puranjhar N about 1.5 km a head of village Patapur and takes the name further and confluences with Brahmani River Near Jayapur Village.
- The total traverse length is about 43.5 km in Dhenkanal districts with its total water shed measured around 400 Sq. kms
- GahiraNadi / DamsalNadi effectively drains the SW part of the study area.
- Cross drainage structures are also provided in the canal distribution system wherever the canal meets its secondary & tertiary drains.

2. Jambhira Nadi / Dhanei Nalla /Pandara Nalla:

- Dhanei Nalla and Pandara Nalla originate from Mahagiri Reserve Forest range located at the Northern (Left) flank of the LBC.
- These two streams and many of their secondary drains intercept the alignment of left Bank Canal. Appropriate drainage crossings (CD work) have been provided in the Canal system at each point of their interception.

- Both Dhanei Nalla and Pandara Nalla confluences each other near Baunasankha Nadi thereafter.

- The total watershed of Jambhira Nadi together with Dhanei Nalla & Pandara Nala measures about 370 sq.km in Dhenkanal district. It traverses about 36 km before it confluences with western flowing Pandara nadi, 1 km below Kanhira village and joins the main flow of River Brahmani at a very short distance.

- These Nallas formed with their several secondary and tertiary drains, become responsible for effectively draining the NE to SE part of the command area in Dhenkanal districts.

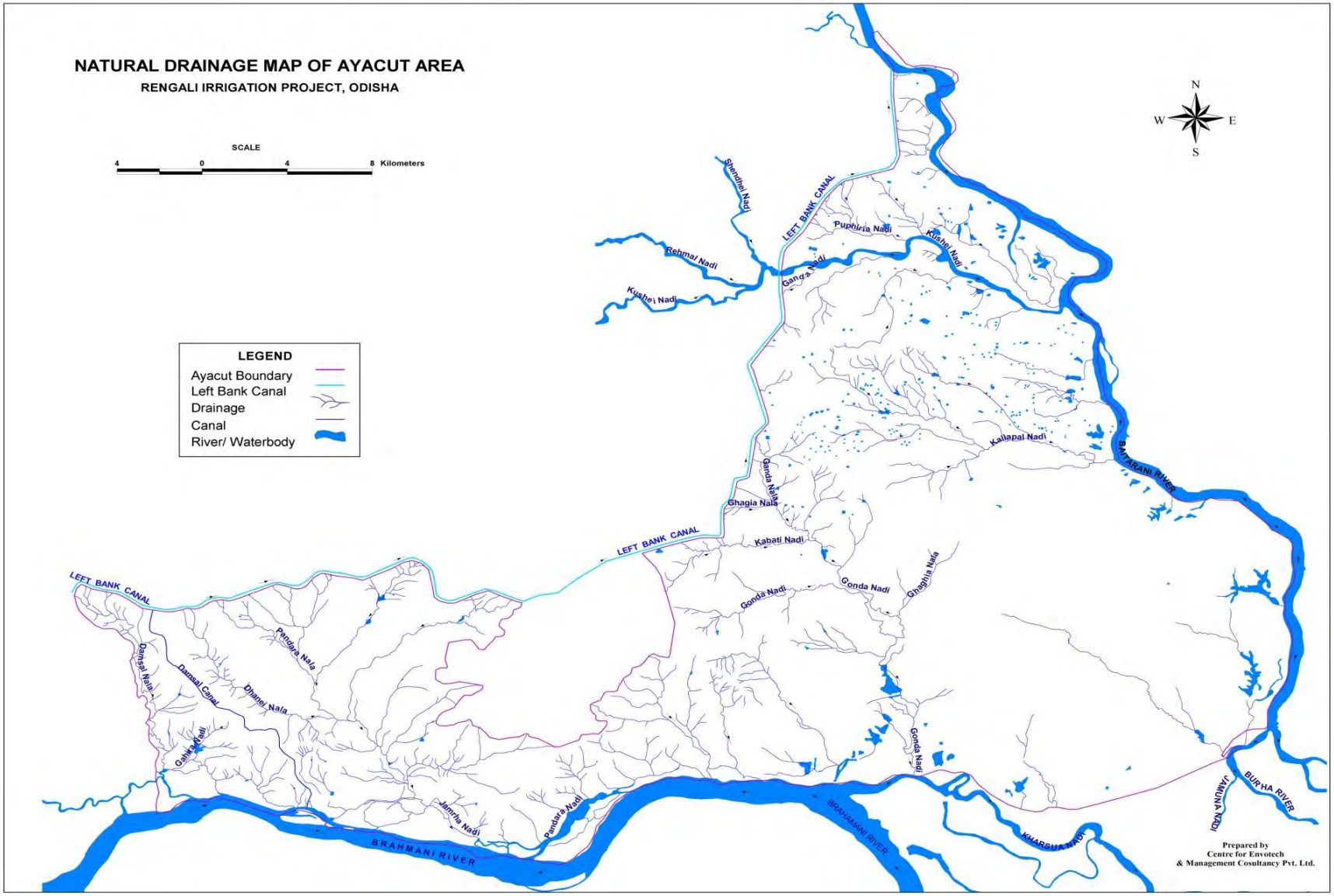


Fig.No.C3-9: Natural drainage map of the ayacut area.

3. GondaNadi & GhagiaNala:

- Gonda Nadi Orginates from the Hill ranges of Baribali R.F at its eastern flank and traverses east, when it meets its counterpart 'Ganda N' Originated from barrage R.F Range. Gaghia N, its small tributary joins below Ranipada village.
- Together these Nallas traverses 33 kms in Jajpur districts, its total water shed being 173 sq. kms
- Gonda Nadi finally confluences Kharsuan river near village Marthapur
- Gonda Nadi with its several secondary drains effectively drains the mid study area in Jajpur districts.

4. Kaliapal Nalla:

Kaliapal nalla originates from MeghanadPahi R.F and Patilo RF range and traverses SE direction. Its total traverse length is about 19 km in the total watershed of 84 sq.km in Jajpur district. Kaliapal Nalla finally it joins the river Baitarani Near village Ranpur. It takes care of drainage for the NE part of the study area.

5. Kusei Nadi & Phabudia Nalla:

- Kusei Nadi is one of the major tributaries of Baitarani River, which originates from the Rebena Reserve forest range of Keonjhar Districts.
- The left Bank Canal Crosses Kusei Nadi at its RD 125 80 km and flows east to S-E direction to confluence river Baitarani near village Karadapa.
- The left Bank Canal crosses the river by means of a major CD work (Aqueduct).
- Small tributaries like phapudia Nalla at its left and other small drains join Kussei Nadi in its traverse length within the study area. Kussei takes care of the drainage of study area in Keonjhar district.

6. Other Unnamed Direct Drains:

- Apart from the above mentioned significant streams and drains, there are a number of small drains existing in the study area which directly drain in to the major river systems i.e. Brahmani and Baiterani.
- To Summarise it may be stated that the study area is well drained to the existing river system except for influence of occasional floods in this deltaic region.

3.8.3 Hydrogeomorphology:

The project area comprises of different hydrogeomorphic features like hills, ridges and valley plains etc. Major part of the project area is covered by Pediplains & lateritic plains. Hills like Denudational hill, residual hill are found in the central part and in the southern-west part of the project area. Pediments are found around the hills which is very less in quantity in comparison to the total area. Flood plains are found along the river side in south of the project area. Valley fills are found everywhere within the ayacut, but in a discontinuous manner. Small patches of Linear ridge are found in the central, northern and western part of the ayacut. The other details are as follows. The hydrogeomorphic features are shown in **Fig.No.C3-10.**

Denudational Hill: These are more resistant formations which stand as hills formed by differential erosion and weathering of the surrounding formations. The Ground water potential is poor to nil.

Structural Hill: These are structurally controlled hills and traversed by numerous joints and fractures facilitating ground water infiltration. Prospect of ground water in these units is poor.

Residual Hill: These hills are formed due to differential erosion and weathering, so that a more resistant formation stand as mountain/hill. Ground water potential in this area is poor.

Pediments: These are gently sloping smooth erosional surface between hills and plains. This unit is found bordering the hilly terrain. Ground water potential in these units is poor to moderate.

Linear Ridge: These are linear, narrow, low lying relief generally barren and the ground water potential is poor in these areas. This area is consisting of banded hematite jasper and mostly found in the northern part of the ayacut.

Valley Fill: These are narrow fluvial valleyes where unconsolidated sediments have been deposited by stream or rivers. They comprise of boulders, cobbles, pebbles, gravel, sand, silt and clay. Ground water potential is very good.

Lateritic Plain Moderate: These are large areas marked by coalescence of pediments. Ground water prospect is poor to moderate depending on the thickness of the pediplain. This area also contains alluvial plain, deltaic plain, buried canal, palaeo canal, canal bars, point bars etc.

Flood Plain: These are flat surfaces adjacent to rivers and composed of unconsolidated sediments. Ground water potential is very good in these areas.

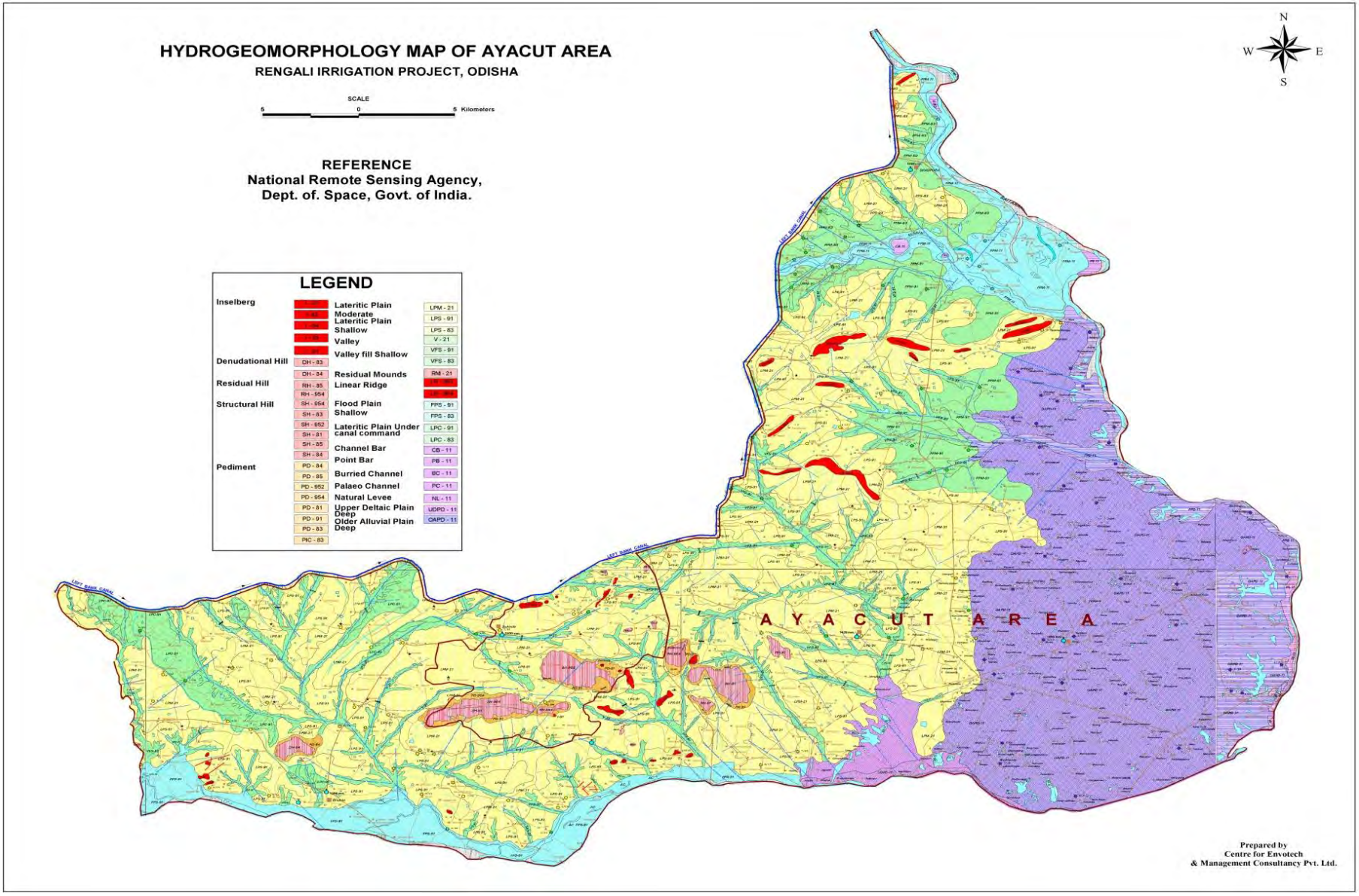


Fig.No.C3-10: Hydrogeomorphology map of the ayacut area

3.8.4 Water Quality:

Water is available in the study area in the form of surface water & ground water. There are some seasonal and perennial streams flowing from the nearby areas. Both surface and ground water samples were collected for analysis of various parameters on 27th and 28th of September 2013 for monsoon and 8th – 10th October 2013 for post-monsoon. All the sampling locations of the project area from which water samples were collected are marked in **Fig.No.C3-11.**



Water Quality Monitoring Locations of the Study Area (Pre Monsoon)

Station code	Location	Type	Distance	Direction
			With respect to nearest Main Canal	
Surface Water				
SW1	Chadipal	Pond	10.59 km	S
SW2	Marthapur	Pond	16.49 km	S
SW3	Brahmani River at Samal Barrage Pond	River	58.00 km	W

Water Quality Monitoring Locations of the Study Area (Post Monsoon)

Station code	Location	Type	Distance (km)	Direction
			With respect to nearest Main Canal	
Surface Water				
SW1	Panaspal	Canal	0.1	N
SW2	Chadipal	Pond	10.59	S
SW3	Gohira	Pond	0.18	E
SW4	Belabahali	River	7.48	S
SW5	Korda	Pond	26.46	SE
SW6	Laxminagar	Pond	20.5	S
Ground Water				
GW1	Marthapur	Tube Well	16.49	S
GW2	Gohira	Tube Well	0.18	E
GW3	Belabahali	Bore well	7.48	S
GW4	Korda	Tube Well	26.46	SE

3.8.4.1 Methodology for sampling procedure:

Sampling is done as per APHA guideline. Proper procedure was followed during sample collection and carefully stored to avoid contamination prior to analysis.

Method of Parameter Testing

Sl. No.	Parameter	Method
1.	Turbidity	APHA 2130 B
2.	pH	APHA 4500 (B)
3.	colour	APHA 2120 (B)
4.	Total dissolved solids	APHA 2540 (C)
5.	Total Suspended Solids,	APHA 2540 (D)
6.	Total Hardness	APHA 2340 (C)
7.	Calcium	APHA 3500 Ca (B)
8.	Magnesium	APHA 3500 Mg (B)
9.	Alkalinity, Total (Ph 4.5)	APHA 2320 (B)
10.	Chloride	APHA 4500 Cl (B)
11.	Dissolved Oxygen	APHA 4500(B)
12.	Biochemical Oxygen Demand (3	APHA 5210(B)
13.	Chemical Oxygen Demand	APHA 5220(B)
14.	Phosphorus, Phosphate	APHA 4500 (D)
15.	Odor	APHA 2150 (B)
16.	Iron	APHA 3500 (B)
17.	Dissolve oxygen	
18.	Conductivity	APHA 2510 (B)
19.	Sulphate	APHA 4500 So4 (E)
20.	Nitrate	APHA 4500 NO3(B)
21.	Fluoride	APHA 4500 F- (D)
22.	Sodium	APHA 3500 Na (B)
23.	Potassium	APHA 3500 K (B)
24.	Cyanide	APHA 4500Cn-(D)
25.	Salinity	
26.	Total Colliform	APHA 9221(B)
27.	E-Colli	APHA 9221(F)
28.	Cadmium	APHA 3500 Cd
29.	Lead	APHA 3500 Pb
30.	SAR	
31.	Boron	APHA 3500 (B)
32.	Chromium	APHA 3500 Cr (B)
33.	Feacal Colliform	APHA 9222(D)

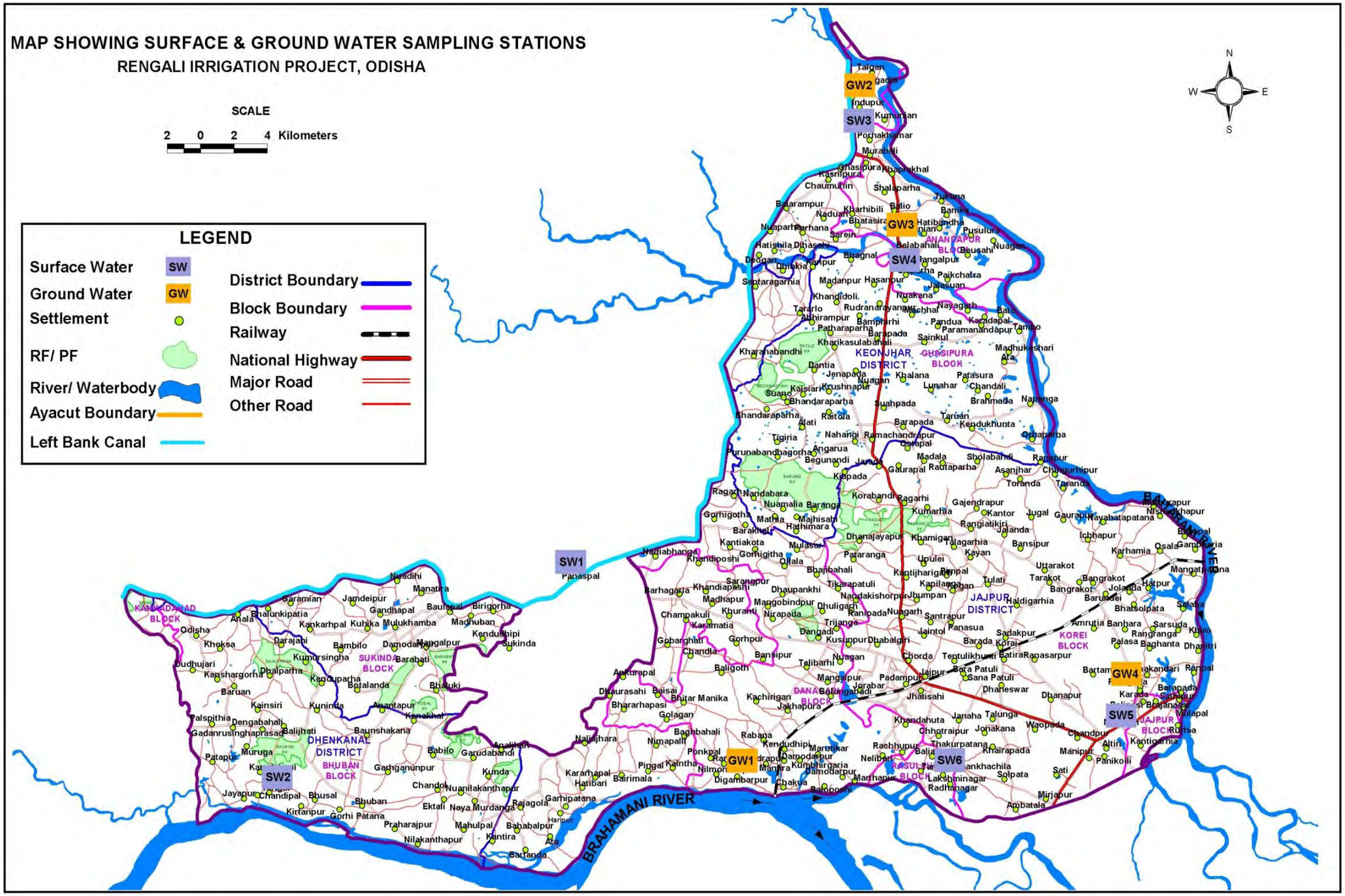


Fig.No.C3-11: Location map of the Post Monsoon water monitoring stations

3.8.4.2 Surface Water Analysis Report (Pre Monsoon)

Sl.No.	Parameter	Unit	IS:10500 Drinking Water	Desirable limit as per CPCB (DBU, Class-E)	Chandipal SW	Marthapur SW	Brahmani River at Samal Barrage
1.	Colour	Hazen	5	--	15	15	20
2.	Odour		UO	--	UO	UO	UO
3.	Taste		Agbl	--	Agbl	Agbl	Agbl
4.	Conductivity	µmho/cm		2250	189	214	312
5.	Turbidity	NTU	5	--	6	5	26
6.	pH		6.5-8.5	6.0-8.5	6.5	6.8	8.0
7.	COD	Mg/L		--	12.2	14.3	38.5
8.	BOD	Mg/L		--	3	3	5.0
9.	Total Hardness	Mg/L	300	--	114	72	116
10.	Iron	Mg/L	0.3	--	3.0	0.6	3.3
11.	Chloride	Mg/L	250	600	18	59	11.5
12.	Residual Chlorine	Mg/L	0.2	--	ND	ND	ND
13.	Total Suspended Solid	Mg/L		--	73	12	
14.	Total Dissolved Solid	Mg/L		2100	115.6	387	5.2
15.	Dissolved Oxygen	Mg/L		--	ND	2.3	7.2
16.	Calcium	Mg/L	75	--	30.5	52.3	16.3
17.	Magnesium	Mg/L	30	--	5.8	16.5	12.8
18.	Sulphate	Mg/L	200	1000	0.97	4.6	13.7
19.	Nitrate	Mg/L	45	--	11.6	ND	0.72
20.	Fluoride	Mg/L	0.6-1.2	--	0.7	0.5	0.7
21.	Phosphate	Mg/L		--	1.3	1.03	1.1
22.	Sodium	Mg/L		--	103	62	12.0
23.	Potassium	Mg/L		--	5.1	2.2	4.9
24.	Cyanide	Mg/L	0.05	--	ND	BDL	BDL
25.	Chromium	Mg/L	0.05	--	BDL	ND	BDL
26.	Boron	Mg/L		2	0.07	0.06	0.07
27.	SAR	Mg/L		26	4.5	1.89	4.6

Note: UO: Un-objectionable, Agbl: Agreeable, ND: Not Detectable, DBU: Designated Best Use

3.8.4.3 Surface Water Analysis Report (Post Monsoon)

Sl. No.	Parameter	Unit	IS:10500 Drinking Water	Desirable limit as per CPCB (DBU, Class-E)	SW1	SW2	SW3	SW4	SW5	SW6
1.	Colour	Hazen	5	--	10	15	10	20	20	15
2.	Odour		UO	--	UO	UO	UO	UO	UO	UO
3.	Taste		Agbl	--	Agbl	Agbl	Agbl	Agbl	Agbl	Agbl
4.	Conductivity	µmho/cm		2250	236	183	157	86	112	283
5.	Turbidity	NTU	5	--	<1	2	2	9	5	1
6.	pH		6.5-8.5	6.0-8.5	7.9	6.5	6.4	6.9	6.6	6.6
7.	COD	Mg/L		--	ND	ND	12	40	60	60
8.	BOD	Mg/L		--	ND	ND	2	17	27	25
9.	Total Hardness	Mg/L	300	--	126	114	54	102	62	70
10.	Iron	Mg/L	0.3	--	3.2	3.2	0.2	4.0	3.7	0.4
11.	Chloride	Mg/L	250	600	20	18	36	11	26	59
12	Residual Chlorine	Mg/L	0.2	--	ND	ND	ND	ND	ND	ND
13.	Total Suspended Solid	Mg/L		--	34	73	6.4	383	9.6	11
14.	Total Dissolved Solid	Mg/L		2100	609	115.6	879	237.6	572	747
15.	Dissolved Oxygen	Mg/L		--	5.6	ND	3.5	5.7	4.5	3.4
16.	Calcium	Mg/L	75	--	20	30.5	10.4	12	10.4	20.8
17.	Magnesium	Mg/L	30	--	18.5	5.8	6.8	63.18	9	4.3
18.	Sulphate	Mg/L	200	1000	6.0	0.97	3.6	8.6	12	16
19.	Nitrate	Mg/L	45	--	ND	12.8	0	0.5	0.6	0.3
20.	Fluoride	Mg/L	0.6-1.2	--	1.05	ND	0.4	1	ND	0.4
21.	Phosphate	Mg/L		--	1	1.5	1	13.7	4.2	1
22.	Sodium	Mg/L		--	50	103	160	69	154	630
23.	Potassium	Mg/L		--	0.6	5.5	8.8	2.7	10.2	32.8
24.	Cyanide	Mg/L	0.05	--	BDL	ND	BDL	ND	ND	ND
25.	Chromium	Mg/L	0.05	--	ND	BDL	ND	BDL	0.3	BDL
26.	Boron	Mg/L		2	0.23	0.08	0.12	0.12	0.14	0.24
27.	SAR	Mg/L		26	1.66	4.5	9.45	4.05	6.09	17.30
28.	Lead	Mg/L	0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
29.	Cadmium	Mg/L	0.01	--	<0.01	<0.01	<0.01	<0.01	0.04	0.01
30.	Mercury	Mg/L	0.001	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
31.	Copper	Mg/L	0.05	--	<0.05	<0.05	<0.05	<0.05	0.16	0.07

Note: UO: Un-objectionable, Agbl: Agreeable, ND: Not Detectable

3.8.4.4 Ground Water Analysis Report (Post Monsoon)

Sl. No.	Parameter	Unit	IS:10500 Drinking Water	Desirable limit as per CPCB (DBU, Class-E)	GW1	GW2	GW3	GW4
1.	Colour	Hazen	5	--	4	2	10	3
2.	Odour		UO	--	UO	UO	UO	UO
3.	Taste		Agbl	--	Agbl	Agbl	Agbl	Agbl
4.	Conductivity	µmho/cm		2250	321	423	140	200
5.	Turbidity	NTU	5	--	<1	<1	<1	<1
6.	pH		6.5-8.5	6.0-8.5	6.9	6.5	6.8	6.9
7.	COD	Mg/L		--	ND	ND	20	ND
8.	BOD	Mg/L		--	ND	ND	7	ND
9.	Total Hardness	Mg/L	300	--	322	342	466	172
10.	Iron	Mg/L	0.3	--	0.5	0.2	0.1	0.1
11.	Chloride	Mg/L	250	600	20	80	219	9
12	Residual Chlorine	Mg/L	0.2	--	ND	ND	ND	ND
13.	Total Suspended Solid	Mg/L		--	9.8	8.4	10.6	1
14.	Total Dissolved Solid	Mg/L		2100	331	346	1609	228
15.	Dissolved Oxygen	Mg/L		--	1.7	4.6	2.1	2.9
16.	Calcium	Mg/L	75	--	13.6	79.3	110.6	57.7
17.	Magnesium	Mg/L	30	--	9.2	35.0	46.2	7
18.	Sulphate	Mg/L	200	1000	3.4	17.7	29.6	2
19.	Nitrate	Mg/L	45	--	ND	0.8	0.5	0.4
20.	Fluoride	Mg/L	0.6-1.2	--	1.1	0.3	1	0.6
21.	Phosphate	Mg/L		--	0.7	1	2	0.5
22.	Sodium	Mg/L		--	73	57	2900	18
23.	Potassium	Mg/L		--	2.4	1.5	35.2	0.6
24.	Cyanide	Mg/L	0.05	--	BDL	BDL	ND	ND
25.	Chromium	Mg/L	0.05	--	ND	ND	BDL	BDL
26.	Boron	Mg/L		2	BDL	BDL	1.23	BDL
27.	SAR	Mg/L		26	3.76	1.35	58.37	0.61
28.	Lead	Mg/L	0.05	--	<0.05	<0.05	<0.05	<0.05
29.	Cadmium	Mg/L	0.01	--	<0.01	<0.01	<0.01	<0.01
30.	Mercury	Mg/L	0.001	--	<0.001	<0.001	<0.001	<0.001
31.	Copper	Mg/L	0.05	--	<0.05	<0.05	<0.05	<0.05

Note: UO: Un-objectionable, Agbl: Agreeable, ND: Not Detectable

Discussion:

To access the surface and ground water quality of the study area six surface water and four groundwater sampling locations were selected. The analysis result shows that Colour of the water at different locations ranges between 10-20 Hazen,

conductivity ranges from 86-283 µmho/cm, pH indicated that at five sampling locations the water was slightly acidic in nature and in SW1 the water is alkaline in nature. The DO value is found between 3.4-5.7 mg/l. Thus in respect of DO, the water quality remains quite healthy at all points. All the heavy metals content of water at different locations are well within the limit except cadmium and copper value in location SW5 which shows higher value.

The analytical results of surface water samples at different locations for various parameters reveal that all the parameters comply with IS: 2296 (Class 'C') standards indicating their suitability for drinking and other purposes after conventional treatment followed by disinfection. Similarly the analysis results of groundwater samples showed all the parameters are within the prescribed limits as per IS: 10500 standards for drinking water.

3.8.5 DEPTH TO WATER LEVEL:

The Depth to Water Level measurements were taken up during 8th – 11th October and 19th - 20th November, 2013 in the post monsoon period and the observations were furnished in **Table No. C3-11**. Since the water levels were very close to the ground surface during the course of water level measurement, therefore summer water levels of the same wells were asked to the concerned villagers and were recorded, which are also given in the following table. The locations where water levels measured are shown in the Depth to Water Level map of the ayacut area of the project site are given in **Fig.No.C3-12.**

Table No. C3-11: Details of locations of monitoring wells and water levels

Well No	Location of monitoring wells	Latitude	Longitude	Water level mbgl	Water level mbgl (summer)
W1	Chandipal	20^0 53′ 06.0″ N	85^0 46′ 38.6″ E	3.25	10.5
W2	Damadarpur	20^0 53′ 37.5″ N	86^0 05′ 49.0″ E	2.54	6.7
W3	Panasapal (Hudisahi Village)	21^0 00′ 00.1″ N	85^0 56 35.3″ E	5.38	12.5
W4	Laxminagar	20^0 54′ 2.1″ N	86^0 08′ 39.0″ E	0.55	9.0
W5	Belbahali	86^0 07′ 41.8″ N	21^0 09′ 55.0″ E	0.62	9.0
W6	Ragadi	21^0 02′ 9.2″ N	86^0 6.7′ 39.0″ E	0.7	4.5
W7	Barundei	20^0 15′ 35.4″ N	85^0 46′ 35.5″ E	0.55	

W8	Ranapur	21^0 03′ 2.2″ N	86^0 12′ 15.6″ E	1.64	7.3
W9	Chandali	21^0 05′ 37.6″ N	86^0 10′ 2.2″ E	5.39	11
W10	Bamphidi	21^0 07′ 57.9″ N	86^0 06′ 8.0″ E	0.67	4.4
W11	Suano	21^0 05′ 22.6″ N	86^0 03′ 49.6″ E	0.71	7.5
W12	Barakhai	21^0 01′ 22.6″ N	86^0 02′ 41.1″ E	2.54	7.4
W13	Dhuligarh	20^0 58′ 46.11″ N	86^0 01′ 41.1″ E	0.54	5.0
W14	Ramachandrapur (Manoharpur)	20^0 54′ 07″ N	86^0 01′ 41.1″ E	3.03	7.2
W15	Ankurapal	20^0 56′ 42.0″ N	85^0 58′ 25.5″ E	0.94	7.16
W16	Sukinda	20^0 52′ 52.9″ N	85^0 54′ 52.7″ E	1.51	9.1
W17	Haripur	20^0 52′ 52.9″ N	85^0 55′ 56.5″ E	1.16	8.0
W18	Nua-Nilakanthapur	20^0 53′ 13.3″ N	85^0 53′ 24.5″ E	5.35	10.8
W19	Gadagaunpur	20^0 53′ 51.7″ N	85^0 50′ 26.1″ E	0.8	
W20	Kansargada	20^0 56′ 51.6″ N	85^0 45′ 21.1″ E	1.7	9.4
W21	Bambilo	20^0 57′ 36.1″ N	85^0 49′ 24.2″ E	1.42	8.6

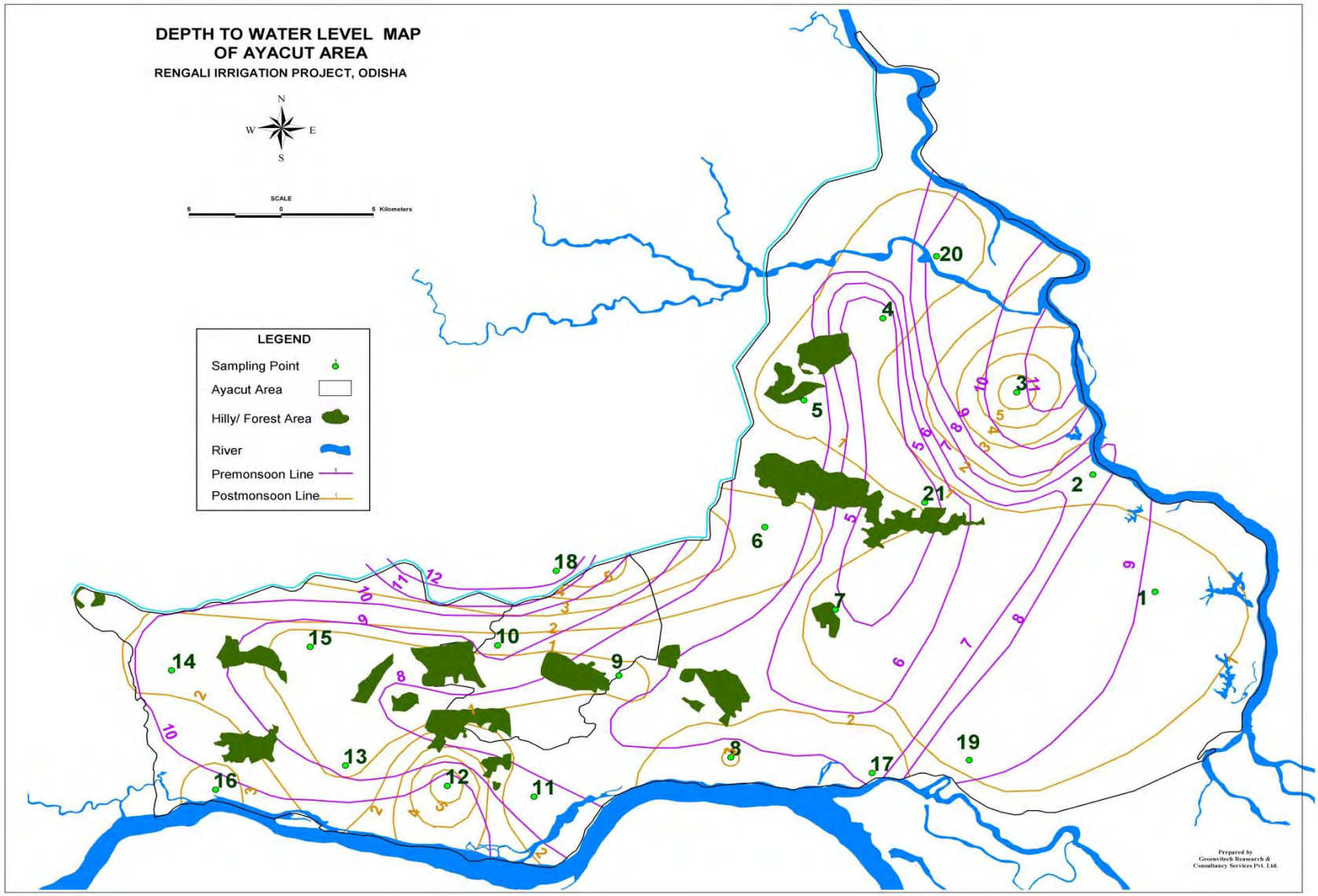


Fig.No.C3-12: Depth to water level map of the Ayacut area of Pre- and post-monsoon period.

3.8.5.1 Waterlogged areas:

Depth to water level measurements were conducted in 21 locations. Ground water level contours are drawn for pre & post monsoon seasons. Most of the areas exhibit high ground water levels during post monsoon.

3.8.5.2 Water logging and areas prone to waterlogging:

Water logging occurs due to steady rise of ground water table after introduction of irrigated agriculture. Without provision of adequate drainage measures waterlogging phenomenon may appear due to

I. the natural landscape
II. man-made irrigation activities in those areas where ground water table rises high.

3.8.5.3 Existing Waterlogging Scenario in three districts:

The valley bottom lands are usually water logged, in a flat alluvial terrain having a meandering river system often exhibit different land types like back swamps silted up ox-bows etc. which undergoes geomorphic process to transform in to depressed land scape. With introduction of irrigation to such alluvial region, the land becomes waterlogged. In the study area, water logging situation appear in the lower Brahmani Delta near Brahmani Kharsuan doab and may extend to the study area with introduction of irrigation.

Relationship of waterlogging to irrigation in Brahmani basin.

Table No. C3-12: Water logging in the basin (Area in 000 ha)

Sl. No.	Name of the District	Net sown area	Area under Irrigation (KA+RB)	% of Area under Irrigation Vs. Sown area	Total land water logged	Percentage of waterlogged area to irrigated area
1.	Dhenkanal	119.65	81.07	67.75	0.319	0.39%
2.	Jajpur	141.36	87.01	61.55	0.512	0.58%
3.	Keonjhar	206.55	103.62	50.16	0.063	0.06%
Source : I. District Statistical hand book 2009 II. ORSAC Wetlands of Orissa 1996 III. Brahmani Basin plan (Govt. of Odisha) Sectorial Study						

From the above district wise scenario, reconstructed to 2009 figures, suggest that

- Waterlogging possibilities in Keonjhar district is almost negligible
- Jajpur districts exhibits 0.58% of waterlogged area limited to coastal alluvial plains.
- Dhenkanal districts exhibits 0.39% of waterlogged area which is very minimum and may occur in limited areas of riverine doab.
- It may be inferred that the proposed command area of LBC-II at 72964 ha may not be adversely affected with waterlogging.

3.8.5.4 POSSIBILITIES OF WATERLOGGING IN THE COMMAND AREA AS PER MONITORED DATA:

Study is undertaken for ground water fluctuations in the command area. Details already described in the previous paragraphs. The period of field study is 19th/ 20th October 2013, when the entire State of Odisha was experiencing cyclone & Heavy rainfall. The measured ground water tables in different open wells have reached almost their peak level.

The monitored Depth to water level (DTWL) data have been formatted, in **Table No. C3-11** and the post Monsoon ground water contours are exhibited in the **Fig.No.C3-12.**

As per the recommendation of Central Ground water Board CGWB, the areas having the following DTWL Criteria may develop waterlogging conditions.

Box No. 6: Water logging classification

Ground water level	Waterlogging Classification
Between 0-2m bgl	Severe water logging Capability
Between 2-4m bgl	Prone to water logging
Between 4-6m bgl	Less chance of water logging

3.8.6 SEDIMENT QUALITY:

3.8.6.1 Sources of Heavy Metal in sediments:

JICA in their recent guidelines for Environmental & Social Consideration (Year 2010) emphasized assessment of sediment quality for finding out the concentration of heavy metals.

Normally when a river flows in undisturbed regions unaffected by human activities, the concentration of most of the metals in water mass, remain very low, the traces being derived from the mineralogy and weathering of the water shed.

However, apart from the natural sources, the anthropogenic sources contribute largely to the building up of heavy metals in river water. The anthropogenic sources include run off from mining, disposal of untreated or partially treated industrial effluents drainage from agricultural crop land having residual pesticide and fertilizers, sewages from different settlements or urban areas, release of metal chelates from different industry, etc.

Dams / barrages built across the river bed form reservoirs for storage of huge quantities of water and as such facilitate building up of sediments on the river bed. Heavy metals discharged into aquatic systems may be immobilized within the stream sediments by main process such as adsorption, flocculation and co-precipitation. Therefore sediments in aquatic environment serve as a pool that can retain metals or release metals to the water column by various process of re mobilization. Therefore heavy metals are highly concentrated in sediments than in water since the sediments act as reservoir for all contaminants and dead organic matter descending from the eco-system.

3.8.6.2 Sediment Quality Analysis:

The Rengali Irrigation Subproject LBC–II Phase-II canal system is an extension of canal system and does not include any dam / reservoir in the present scheme. Hence sediment quality analysis for heavy metals has not been done. However literature survey of sediment quality data mentioned for Bhitarakanika area of Brahmani river has been rationally applied for this project. The same is detailed below.

3.8.6.3 Analysis of Sediment from Brahmani River at Bhitarakanika Estuary:

Bhitarkanika is the estuarine area where river Brahmani meets the sea. This the intertidal area which is subjected to substantial stress due to disposal of industrial effluents, domestic sewages, drainage of agrichemicals from crop land, mining activities etc. Hence the sediment analysis of the estuarine area gives a more critical concentration level than those could be observed from sediments of Samal barrage.

Study of heavy metal concentration in sediments in the Bhitarkanika estuary and the buildup of heavy metal concentration in various plant species in the mangrove was studied by a group of scientist of CSIR Institute of Minerals and materials technology which appeared in the journal "Research in Plant Biology, 3(6) 01-05, 2013.

3.8.6.4 Sample Collection, Preparation & Analysis:

The sediment samples surrounding the root systems of different mangrove species wise collected using vertical layer, transferred to clean polythene bags and shade dried to constant weight. Sediments were ground and sieved through mesh (size 0.5 mm). The samples of sediments so prepared were put in plastic vials with labels and kept in dericators. Accurately 1 gm of dry powder of each sample was weighed and digested with conc. HNO_3, H_2SO_4 and H_2O_2 (2:6:6) as prescribed by Saison etal (2004). Towards the end of digestion the flasks were brought to near dryness. The solution was made up to 20 ml each in measuring cylinder with double distilled water and examined for heavy metals by Inductive Coupled Plasma Analyzer (ICPA) (Perkin-Elmg ICP Optima 3300 RL, USA) at CSIR-IMMT. Mean value of triplicate of each samples of the sediment was calculated and considered.

Analysis Results:

Heavy Metal	**Conc. Level in µg/l**
Lead	8.66-19.02
Copper	6.13-21.98
Zinc	37.77-92.00

The heavy metals concentration in sediment sample was in the range of 6.13 to 92 µg/gm.

Sediment quality guideline values for trace elements by US-EPA and TEL/PEL (Long et.al 1991)

	Level of pollution	**Cd.**	**Cr.**	**Cu.**	**Pb**	**Zn.**
SQG	Non-Polluted	-	<25	<25	<40	<90
SQG	Moderate Polluted	>6	>75	>50	>60	>200
SQG	Heavily Polluted	>6	>75	>50	>60	>200
TEL *		0.68	52.3	18.7	30.2	124
PEL *		4.2	160.4	108.2	112.2	271

* TEL – Threshold Effect level is the value below which adverse biological effects would be infrequently expect.

* PEL – Probable effect level i.e. the values above which adverse biological affected would frequency occur.

The sediment sample analysis of Bhitarakanika having been done in 2013, it represents a recent study. The Samal barrage is located about 120 km upstream of Bhitarakanika. River Brahmanai adds to its pollutant load from discharges of conglomerate industries, mostly metal extraction industries at Kalinga Nagar area of Jajpur district. Likewise the river picks up its pollution load from industrial set ups like NALCO, NTPC etc upstream of Samal Barrage.

The analysis of heavy metals in sediments sample of Bhitarakanika are within acceptable level. Hence the same can told for sediment sample of "Samal Barage".

3.8.6.5 Monitoring data for Heavy metal concentration in River water of Brahmani:

The irrigation water flowing from the reservoir of Samal Barrage into the canal system directly affects the human health. Therefore, the heavy metal concentration in the irrigation water has been done. Water samples collected from the study area have been analysed as per the details given below;

3.8.6.6 Study Area & Study Period:

The sample was drawn from River Brahmani near Samal Barrage.

Co-ordinates: 21^0 04′ 22″ N and 85^0 08′ 10″ E

Period: Post monsoon – October 2013.

3.8.6.7 Sampling Method and Laboratory Testing:

Water sample was collected from left bank shore of Barrage pond. The samples was taken from 10 to 15 cm below the water surface using acid washed plastic container to avoid unpredictable changes in characteristics as per standard procedures (APHA 1998), concentration of heavy metals in water samples was determined with an Atomic Absorption Spectrophotometer (AAS).

The heavy metal concentration in Brahmani River water has also been obtained from secondary source like a publication of State Pollution Control Board Odisha – *"Water Quality of Major Rivers of Odisha"*. Literature survey has also been made and heavy metal concentration in Brahmani River water have been collected from a study report made by a group of scientists of Indian School of Mines, Dhanbad under the heading "Heavy Metal Concentration and its Indexing approach for River Water appearing in the *International Journal in Environmental Science & Technology, autumn – 2010*.

3.8.6.8 Analysis Results:

Dissolved heavy metal concentrations in water sample collected from left bank shore of Barrage pond.

Sl. No.	Heavy Metals	Unit	* Result (Avg. Value of sample collected in October 2013)	** Result (Avg. Value of sample collected in April 2006)	*** Result obtained from literature survey Summer & Winter 2007-08 (Range)	Tolerance limit mg/l (IS-10500, 1993)
1	Lead (Pb)	Mg/l	<0.05	0.001	0.010 – 0.027	0.10
2	Cadmium (Cd)	Mg/l	<0.01	0.004	0.0004– 0.004	0.01
3	Zinc (Zn)	Mg/l	--	0.009	0.0004 – 0.08	15.0
4	Copper (Cu)	Mg/l	<0.05	0.002	0.001 – 0.005	1.5
5	Iron (Fe)	Mg/l	0.2 – 4.0	0.91	0.005 – 0.095	1.0

* = Lab. Analysis result of sample collected by CEMC from pond of Samal Barrage.

** = Water Quality of Major Rivers by SPCB, Odisha.

*** = International Journal in Environmental Science & Technology, autumn – 2010.

The study revealed that most of the water samples of River system was found less polluted in heavy metal contamination profile and showed a trend in seasonal variation.

3.9 NOISE & VIBRATION:

3.9.1 Noise Environment:

The physical description of sound concerns its loudness as a function of frequency. Noise in general is an unwanted sound, which is composed of many frequency components of various types of loudness level distributed over the audible frequency range. Sound Pressure Levels (SPL's) are measured in decibels on the A-weighted scale, dB (A), where the A-weighting scheme accounts for the sensitivities of the human ear over the audio spectrum.

3.9.1.1 Noise Levels in the Study Area:

Baseline noise levels have been monitored at different points during 8th – 11th October 2013 within the study area using a noise level meter. Nine noise monitoring stations were identified for the assessment of the existing noise levels keeping in view the nature of the monitoring location i.e. residential areas in villages, schools etc. The noise monitoring locations with reference to the Project is given in the**Table No.C3-13.**

Table No.C3-13: Details of Noise Level Monitoring Locations

Sl. No.	Station Code	Location	Distance (Km)	Direction	Type of Area
			With respect to Main Canal		
1	N-1	Damdarpur	13.65	S	Rural &Residential
2	N-2	Panaspal	0.1	N	Near Tunnel construction site. Rural &Residential
3	N-3	Laxminagar	20.5	S	Rural & Residential
4	N-4	Badapatuli	16.78	S	Residential, Near to Railway
5	N-5	Korda	26.49	SE	Near NH-205, Residential
6	N-6	Belabahali	7.48	S	Near NH-205, Residential
7	N-7	Ghasipura	0.94	S	Near NH-205, Residential
8	N-8	Gohira	0.18	E	Near NH-205, Residential
9	N-9	Ragadi	11.05	S	Near NH-205, Residential

Noise Level monitoring was carried out to measure the sound pressure level in the surrounding villages of the study area on hourly basis to study the impact of the noise on the local environment. The day levels have been monitored between 6.00 A.M and 10.00 P.M and the night levels have been monitored between 10.00 P.M and 6.00 A.M. The monitoring results are presented below in **Table No.C3-14** and locations are shown in **Fig.No.C3-13**



Noise level measurement on NH 205 near Ragadi

Table No.C3-14: Noise Level in the Study Area

Code	Location	Area Category	L_{eq}[dB(A)]	
			Day	Night
N-1	Damdarpur	Rural &Residential	46.2	37.1
N-2	Panaspal	Near Tunnel construction site. Rural &Residential	49.5	41.2
N-3	Laxminagar	Rural & Residential	42.1	35.2
N-4	Badapatuli	Residential, Near to Railway	51.4	45.3
N-5	Korda	Near NH-205, Residential	53.7	47.1
N-6	Belabahali	Near NH-205, Residential	55.3	48.2
N-7	Ghasipura	Near NH-205, Residential	53.9	45.5
N-8	Gohira	Near NH-205, Residential	49.6	41.1
N-9	Ragadi	Near NH-205, Residential	54.8	46.4

Table No. C3-15: Ambient noise quality standards

Area Category	Limits in dB(A)L_{eq}	
	Day Time (6.00 AM to 10.00 P.M)	Night Time (10.00PM to 6.00 AM)
Industrial	75	70
Commercial	65	55
Residential	55	45
Silence Zone	50	40

3.9.1.2 Observations:

The analysis result of noise at different locations shows that noise levels are within the ambient noise quality standards mentioned in **Table No.C3-15**. However, during the construction period the noise level at the limited areas of construction may be slightly higher for a very temporary period. But this will remain within the permissible limits by proper management of machinery and equipment operations.

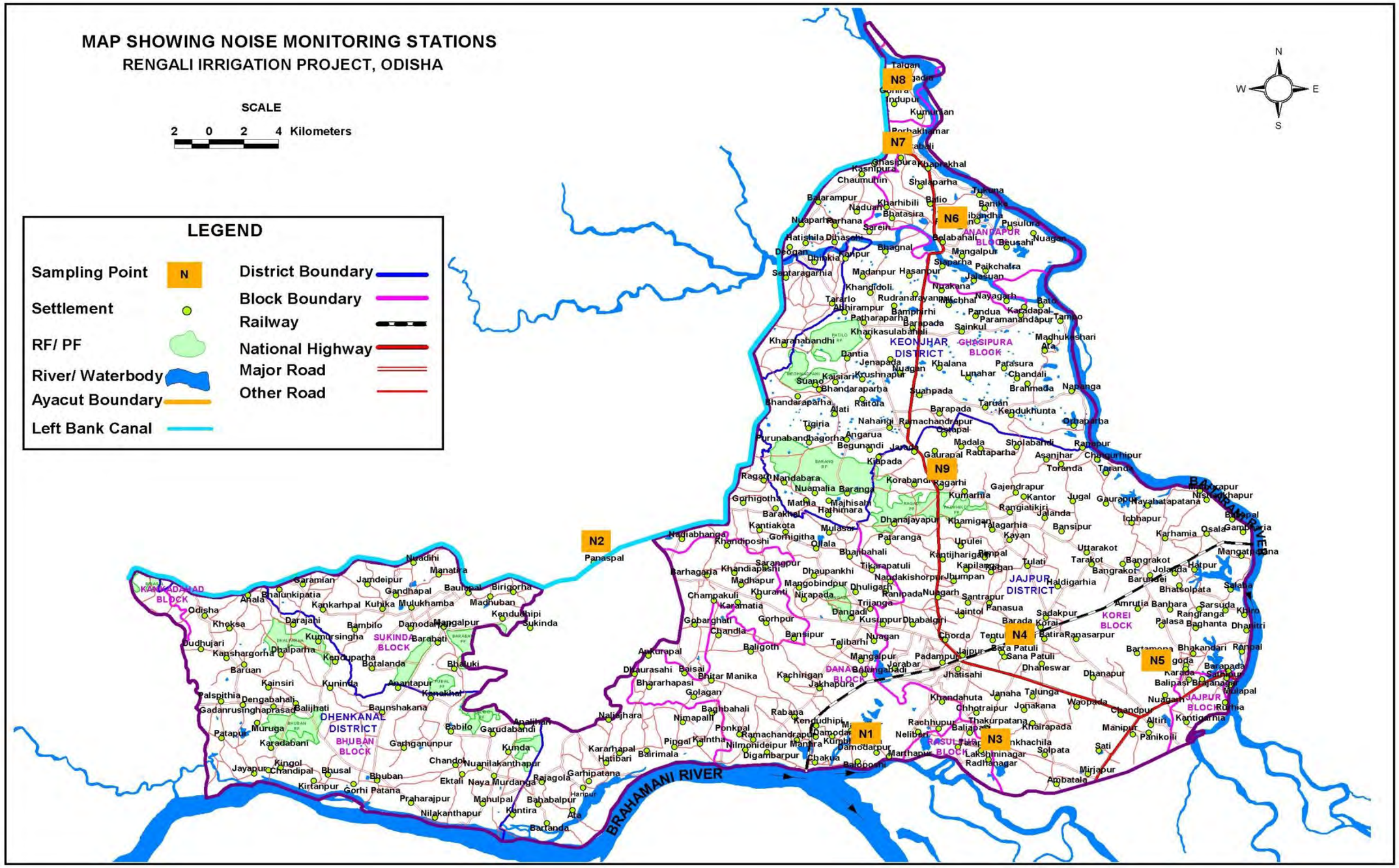


Fig.No.C3-13: Noise Monitoring Location Map

3.9.2 VIBRATION:

Vibration assessments are a key element of the environmental impact assessment process for infrastructure projects. Vibration may lead to damage of cultural assets and other establishments near proposed sites and also may have impact on the human health. Experience has shown that vibration is among the major concerns with regard to the effects of a project on the surrounding community.

Vibration is often associated with noise but is a problem in its own right. Notwithstanding health effects to the surrounding persons it impacts the inmates of the buildings close to the vibration source in the form of scare, sleeplessness and postural discomfiture. It also affects the buildings in the form of short and long term impacts.

Vibration can also be affecting the operators including drivers of special vehicle used during the construction phase. Appropriate mitigation measures will vary but may include design considerations for vehicles and equipment, control of exposure times, proper maintenance, protective clothing and alterations to working practices.

3.9.2.1 Measurement:

Vibratory Motion/ Vibration is an oscillatory motion which can be described in terms of the displacement, velocity or acceleration. Because the motion is oscillatory, there is no net movement of the vibration element and the average of any of the motion descriptors is zero.

The vibration can be measured in terms of Peak Particle Velocity (PPV) and defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is often used in monitoring of blasting vibration since it is related to the stresses that are experienced by buildings.

Although peak particle velocity is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. Because the net average of a vibration signal is zero, the root mean square (rms) amplitude is used to describe the "smoothed" vibration amplitude. The root mean square of a signal is the square root of the average of the squared amplitude of the signal. The average is typically calculated over a one-second period.

Due to the absence of major vibration source, which can contribute in vibration, limited testing have been done to assess the existing vibration levels by measuring PPV levels. There is no historical or sensitive receptors along the proposed route, however, the proposed tunneling alignment is crossing National highway which may contribute increase in vibration level at the time of construction. The details of vibration monitoring locations along with their latitude, longitude and elevation are presented in **Table No.C3-16**.

Table No.C3-16: Details of Monitoring Locations

Sl. No.	Name of Monitoring Locations	Latitude	Longitude	Elevation, m
1.	Hudisahi village	20^0 59′ 54.8″ N	85^0 56′ 59.8″ E	76 m
2.	Dhamangadia	21^0 00′ 21.1″ N	85^0 57′ 49.00″ E	83 m
3.	BabajiSahi (Near NH)	21^0 00′ 39.7″ N	85^0 58′ 53.00″ E	69 m

3.9.2.2 Standards on Vibration Measurements:

There are no specific standards for vibration levels in India. However there are number of international standards (as indicated below) for evaluating the potential impacts for building damage and also the human response.



Vibration measurement near village Hudisahi

ISO Standards on vibration (ISO 2631/2- 1989, ISO 8041-1990, and ISO 4866-1990) JIS Z-8735 (Method of measurement for vibration levels) and JIS C-1510

Methodology

The ambient vibration levels were measured as part of the base line surveys by using vibration meter and PPV values were recorded by vibration meter.

Vibration Levels

Based on the approach formulated above, the vibration levels were measured at three above said locations on 16th November 2013. The vibration levels are presented in **Table No.C3-17.**



Vibration measurement near NH at village Babajisahi

Table No.C3-17: Vibration Level recorded at Different Sites

Sl. No.	Name of Monitoring Locations	Vibration Level (mm/second)
1.	Hudisahi village	<0.03
2.	Dhamangadia	< 0.03
3.	BabajiSahi (Near NH)	0.04

3.9.2.3 Results and Discussions:

The vibration levels are well below the threshold of perception for humans in all the monitoring locations due to absence of any activity which can contribute to vibration. The vibration level along the highway, where the proposed channel crosses the national highway, is maximum at the time of multi-excel trucks crossing the highway. However, the ground level vibrations are also below the perception of human as per ISO (>0.04 mm/s or 65 VdB with reference $1x10^{-6}$ inch per second).

3.10 NATURAL ENVIRONMENT:

To implement the ToR condition agreed by the JICA and the DoWR, a team of ecologist of CEMC visited the Project site several times to collect required information. Jurisdiction of the study is limited to Phase -II of the Project that is the extension of the Left Bank Canal (LBC) of Rengali Irrigation Project from RD 71.313 km to RD 141.0 km connecting at River Baitarani. The whole process of study is to assess the impact of the LBC-II Phase-II on biodiversity i.e. existence

of flora, fauna and movement of mega herbivore in the affected area, located on the left bank of the river Brahmani. It is also felt essential to study the ecological aspects of the already implemented canal system from RD 00 to 71.313 km, to ascertain the effectiveness of measures already executed to address the issues co-relating to wildlife and Bio-diversity conservation of the present study area.

Sl. No.	Name of the Forest
01	Dalaparha R.F.
02	Birasal R.F.
03	Bhuban R.F.
04	Barbati P.F.
05	Pubal P.F.
06	Balibo R.F.
07	Dangadi P.F.
08	Ragadi P.F.
09	Baranga R.F.
10	Meghnadpahi R.F.
11	Patilo R.F.

3.10.1 Study Area:

The study area starts from RD 71.313 km located near Village Sitalbasa within Birasal Reserve Forest (RF) of Dhenkanal Forest Division connecting the River Baitarani near Village Kolagadia of Keonjhar Wildlife Division at RD 141.00 km. In between these two Forest Divisions this Canal system also covers areas of Cuttack Forest Division particularly Tomka and Mahagiri DPFs. The Phase –II canal system is intersecting through Birasal RF (Dhenkanal Forest Division) and Mahagiri DPF (Cuttack Forest Division). The aycut of this LBC is restricted only to the right bank of the Canal system where 4 Reserve Forests and 2 Protected Forests of Dhenkanal Forest Division, one Demarcated Protected Forest & 3 Protected Forests of Cuttack Forest Division and 3 Protected Forests in Keonjhar Wildlife Division are located. Area of each forest and percentage of the area in relation to the ayacut area establish the smallness of wildlife habitat influenced.

Study Period:

The team has taken assistance of Er. P. Behera (Executive Engineer), Er. P. K. Bisoi (SDO, Irrigation), Er. R. Swain (SDO, Irrigation), Er. B.K.Naik (JE, Irrigation) and Mr. G.C. Panda (Amin of Irrigation Dept.) during field visit. The field study was conducted in the following manner on dated 30th & 31st of October, 2013 for reconnaissance; 6th to 7th November, 2013 and 13th November 2013 for data collection for Phase-II and 13.11.2013 for joint field visit with JICA Expert.

3.10.3 Methodology of Data Collection:

Field validation for Completed Phase-I and data collection:

The team consulted the affected villagers, concerned Forest Department Officials and Irrigation Department Executives. For preparation of this report the valid Working Plan of Dhenkanal, Cuttack and Keonjhar Wildlife Divisions have been consulted. In-addition "Right of Passage published by WTI" a Book on elephant corridor, elephant management plan of the Government of Odisha 2009 have also been taken into consideration to study the impact of identified elephant corridor existing in the affected area of Dhenkanal Forest Division i.e. Maulabhanj-Aantpur-Kanheijena. This corridor finds place in the 14 such corridors identified by wildlife wing of the State Forest Department. The Flora has been listed form direct sampling from field and for fauna both direct and indirect evidences have been used for listing them. For Fish and Amphibian samples have been collected from the water body located on the canal path and from both the rivers (Brahmni and Baitarani) connected by the canal system. Also local market was surveyed to identify the fish fauna being sold from the catches of the fishermen. Insect net was used to collect both aquatic and terrestrial species.

Line Transects were followed to identify flora and fauna, Direct sighting, and secondary evidences also recorded, Active Search Method was followed to collect amphibians, Cast net and Gill Net were used to collect fish sample. Local fish market also surveyed to collect fish sample for identification. Foot prints and dung of elephants were actively searched to establish elephant movement path.

Details of the flora and fauna existing in the study area are recorded during our survey is given below:

Table No. C3-18: List of Flora

Sl. No.	Local Name	Botanical Name	Family
1	Amba	*Mangifera indica*	Anacardiaceae
2	Achu	*Morinda pubescens*	Rubiaceae
3	Ankula	*Alangium salvifolium*	Alangiaceae
4	Amla	*Phyllanthus emblica*	Euphorbiaceae
5	Asan	*Terminalia alata*	Combretaceae
6	Aswastha	*Ficus religiosa*	Moraceae
7	Baghamari	*Bahunia retusa*	Fabaceae
8	Bahada	*Terminalia bellirica*	Combretaceae
9	Bara	*Ficus benghalensis*	Moraceae
10	Bel	*Aegle marmelos*	Rutaceae

11	Bhalia	*Semecarpus anacardium*	Anacardiaceae
12	Bheru	*Chloroxylon swietiana*	Meliaceae
13	Bija / Piasal	*Pterocarpus marsupium*	Fabaceae
14	Char	*Buchanania lanzan*	Anacardiaceae
15	Chauldhua	*Glycosmis pentaphylla*	Rutaceae
16	Chikini	*Glochidion lanceolarium*	Euphorbiacea
17	Chotarai	*Dilenia aurea*	Dilleniaceae
18	Chhatian	*Alstonia scholaris*	Apocynaceae
19	Chadeigudi	*Vitex pedancularis*	Verbenaceae
20	Dhaman	*Grewia tillaefolia*	Tiliaceae
21	Dhaura	*Anogeissus latifolia*	Combretaceae
22	Ghantal	*Ziziphus glabrata*	Rhamnaceae
23	Giringa	*Pterospermum xylocarpum*	Sterculiaceae
24	Giridhini	*Sterculia urens*	Sterculiaceae
25	Genduli	*Cochlospermum gossypium*	Bixaceae
26	Gurudu	*Gardenia gummifera*	Verbenaceae
27	Kuruma	*Adina cordifolia*	Rubiaceae
28	Harida	*Terminalia chebula*	Combretaceae
29	Hinjal	*Pongamia pinnata*	Fabaceae
30	Jamun	*Syzygium cumini*	Mytaceae
31	Khakada	*Casearia elliptica*	Flacourtiaceae
32	Kadamba	*Neolamarkia cadamba*	Rutaceae
33	Kaitho	*Limonia acidissima*	Rutaceae
34	Kalicha	*Diospyrus sylvatica*	Ebenaceae
35	Karada	*Cleistanthus collinus*	Euphorbiceae
36	Kasi	*Bridelia retusa*	Euphorbiceae
37	Kendu	*Diospyros melanoxylon*	Ebenaceae
38	Kumbhi	*Careya arborea*	Barringtoniaceae
39	Kurei	*Holarrhena antidysentrica*	Apocyanaceae
40	Kurum	*Adina cordifloia*	Rubiaceae
41	Kusuma	*Schleichera oleosa*	Sapindaceae
42	Manda	*Macaranga peltata*	Anacardiaceae
43	Mankada kendu	*Diospyrus montana*	Ebenaceae
44	Mundi	*Mitragyna parvifolia*	Rubiaceae
45	Muchukunda	*Pterspermum acerifolium*	Sterculiaceae
46	Neem	*Azadirachta indica*	Meliaceae

47	Palasa	*Butea monosperma*	Fabaceae
48	Panasa	*Artocarpus integrifolia*	Moraceae
49	Sal	*Shorea robusta*	Dipterocarpaceae
50	Sidha	*Lagerstroemia parviflora*	Lythraceae
51	Siris	*Albizzia lebbek*	Mimosaceae
Bamboo			
	Salia Baunsa	*Dendrocalamus strictus*	Poaceae
Shrubs			
1	Anantamula	*Hemidesmus indicus*	Periplocaceae
2	Atundi	*Combretum roxburghii*	Combretaceae
3	Dantari	*Acacia pennata*	Mimosaceae
4	Muturi	*Smilax macrophylla*	Smilaceae
5	Satabari	*Asparagus racemosus*	Liliaceae
6	Siali	*Bauhinia vahlii*	Caesalpiniaceae
7	Bankulthia	*Atylosia scarabaeoidis*	Fabaceae
8	Basanga	*Adhatoda zeylonica*	Acanthaceae
9	Dhatki	*Woodfordia fructicosa*	Lythraceae
10	Girelphool	*Indigofera cassioides*	Fabaceae
11	Gurudu	*Gardenia gummifera*	Rubiaceae
12	Ata	*Anona squamosa*	Annonaceae
13	Arakha	*Calotropis gigantia*	Asclepiadaceae
14	Arakha	*Calotropis procera*	Asclepiadaceae
Herbs			
1	Agnijal	*Vernonia cinerea*	Asteraceae
2	Ankhukoli	*Carrissa opaca*	Apocynaceae
3	Ankula	*Alangium salvifolium*	Alangiaceae
4	Bari amla	*Phyllanthus emblica*	Euphorbiaceae
5	Bajra muli	*Sida spinosa*	Malvceae
6	Bana biri	*Vigna radiata*	Fabaceae
7	Bana soris	*Cleome viscosa*	Capparaceae
8	Bana Chakunda	*Cassia tora*	Fabaceae
9	Gila	*Entada scandens*	Mimosaceae
10	Girla	*Indigofera cassioides*	Fabaceae
11	Indrajal	*Holarrrhena malaccensis*	Apocynaceae
12	Khajuri	*Phoenix dantyliferas*	Arecaceae
13	Khirkoli	*Manilkara hexandra*	Sapotaceae
14	Kharkhari	*Clerodendrum viscosum*	Verbenaceae

15	Lantana	*Lantana camara*	Verbenaceae
16	Narguni	*Atalantia monophylla*	Rutaceae
17	Tulsi	*Ocimum sanctum*	Lamiaceae
18	Urguna	*Cycas circinalis*	Cycadaceae
Climbers			
1	Atundi	*Combretum roxburghii*	Combretaceae
2	Baidanka	*Macuna pruriens*	Papilionaceae
3	Bichhuati	*Tragia plukenetii*	Euphorbiaceae
4	Muturi	*Smilax macrophylla*	Liliaceae
5	Dantari	*Acacia pennata*	Mimosaceae
6	Satabari	*Asparagus recemosus*	Liliaceae
7	Siali	*Bauhinia vahlii*	Fabaceae
8	Dudhiali	*Ichnocarpus frutescence*	Apocynaceae
Grass			
1	Kharo Grass	*Imperata cylindrica*	Poaceae
2	Sinkula grass	*Hetropogun contortus*	Poaceae

3.10.4 Findings:

In the study area there are 51 tree species belongs to 46 genus of 24 families; 14 shrubs species belongs to 13 genus of 12 families; 18 herbs belongs to 18 genus of 14 families; 8 climbers belongs to 8 genus of 7 families, one bamboo species and 2 grass species of 2 genus of a family. There was no endangered & threatened tree species found in the study area as per Wildlife Protection Act and IUCN list. So far, in our study we did not notice any endemic plant species with in the study area.

Table No.C3-19: List of Fauna

Mammals				
Local Name	**English Name**	**Scientific Name**	**Schedule of Species in WPA**	**IUCN Category (WII-2012)**
Hati	Elephant	*Elephas maximus*	*I*	*E*
Bhalu	Sloth Bear	*Melursus ursinus*	*I*	*V*
Belara musa	Indian giant squirrel	*Ratufa indica*	*II*	*##*
Harina	Spotted Dear	*Axis axis*	*III*	*##*
Bilua	Jackal	*Canis aureus*	*II*	*V*
Kutura	Barking Deer	*Muntiacus muntjak*	*III*	*##*

Jhinka	Porcupine	*Hystrix indica*	*IV*	*##*
Mankada (Hanu)	Common langur	*Presbytis entellus*	*II*	*##*
Musa	Rat	*Rattus rattus*	*IV*	*##*
Neula	Common mongoose	*Herpestes edwardsi*	*II*	*##*
Saliapatini	Small Indian civet	*Viverricula indica*	*II*	*##*
Sambar	Samber	*Cervus unicolor*	*IV*	*##*
Thekua	Common Indian Hare	*Lepus nigricollis*	*IV*	*##*
Birds				
Ban kukuda	Jungle fowl (red)	*Gallus gallus*	IV	*##*
Baga	Egret little	*Egretta garzetta*	IV	*##*
Baya	Weavers bird	*Ploceus philippinus*	IV	*##*
Bani	Common Myna	*Acridotheres tristis*	IV	*##*
Chila	Common kite	*Milvus migrans*	IV	*##*
Damarakau	Jungle crow	*Corvus macrorhynchos*	IV	*##*
Koili	Asian cuckoo	*Endynamys scolopacea*	IV	*##*
Kapta	Little brown dove	*Streptopelia senegalensis*	IV	*##*
Kapta	Spotted dove	*Streptopelia chinensis*	IV	*##*
Kumbhatua	Crow pheasant	*Centropus sinensis*	IV	*##*
Kathakhumpi	Wood pecker	*Dinopium benghalense*	IV	*##*
Chatak	House Swift	*Apus affinis*	IV	*##*
Titiri	Gray Patridge	*Francolinus pondicerianus*	IV	*##*
Genadlia	Open Bill Stork	*Anastomus oscitans*	IV	*##*
Gau Baga	Cattle Egret	*Bubulcus ibis*	IV	*##*
Bada Baga	Large Egret	*Casmerodius albus*	IV	*##*
Machha ranka	White Breast King Fisher	*Halcyon pileata*	IV	*##*
Bali Khoja	Common Snipe	*Gallinago gallinago*	IV	*##*

Kajalapati	Black Drongo	*Dicrurus macrocercus*	IV	##
Reptiles				
Boda sapa	Common Boa	*Boa constricta*	*IV*	##
Dhamana	Rat snake	*Ptyas mucosus*	II	##
Endua	Common garden lizard	*Calotes versicolor*	IV	##
Chiti	Common Indian krait	*Bungarus caeruleus*	II	##
Jhitipiti	Common Indian House Gecko	*Hemidactylus flaviviridis*	IV	##
Ajagar	Indian Python	*Python molurus*	I	##
Dhanda	Piscator	*Xenochrophis piscator*	II	##
Kala Naga	Acellate cobra/ Black cobra	*Naja oxiana*	II	##
Naga Sapa (Gokhar)	Binocellate Cobra	*Naja naja*	IV	##
Godhi	Common Indian Monitor	*Varanus bengalensis*	II	##
Amphibian				
Pani Benga	Indian Bull Frog	*Rana tigerina*	##	##
Ghara Benga	Common Indian Toad	*Bufo melanostictus*	##	##
Katha Benga	Common Tree Frog	*Polypedates maculatus*	##	##
	Skittering Frog	*Euphlyctis cyanophlyctis*	##	##
Pisces				
Common Name	***Scientific Name***	**Schedule of Species in WPA**	**IUCN Category (WII-2012)**	
Addi	*Sperata seenghala*	##	##	
Balia	*Wallago attu*	##	##	
Balikida	*Glossogobius giuris*	##	##	
Bankoe	*Chela laubuca*	##	##	

Bata	*Labeo bata*	##	##
Bhakura	*Catla catla*	##	##
Bumi	*Mastacembelus armatus*	##	##
Chanda	*Chanda nama*	##	##
Godisha	*Channa punctatus*	##	##
Gongituri	*Xenentodon cancila*	##	##
Jalanga	*Pangasius pangasius*	##	##
Jhai	*Esomus danricus*	##	##
Kat Chanda	*Pseudambassis lala*	##	##
Kolisa	*Colisa fasciata*	##	##
Kou	*Anabas testudineus*	##	##
Kou	*Anabas oligolepis*	##	##
Magur	*Clarias batrachus*	##	##
Mirikali	*Cirrhinus mrigala*	##	##
Pholai	*Notopterus notopterus*	##	##
Pothi	*Puntius sophore*	##	##
Rui	*Labeo rohita*	##	##
Saulo	*Channa striatus*	##	##
Singi	*Heteropneustes fossilis*	##	##
Swarna punti	*Puntius sarana*	##	##
Tit Punti	*Puntius ticto*	##	##
Torhi	*Mastacembelus pancalus*	##	##
Insects			
Beetles			

Common Name	Scientific Name	Schedule of Species in WPA	IUCN Category (WII-2012)
Click Beetle	*Ampedus sanguineus*	##	##
Ground Beetle	*Pterostichus oblongopunctatus*	##	##
Common Weevil	*Hypera zoilus*	##	##
Lady bird Beetle	*Coccinella septempunctata*	##	##
Leaf Beetle	*Letinotarsa decemlinea*	##	##
Ants			
Black ant	*Formica fusca*	##	##
Common ant	*Camponatus ligniperda*	##	##
Sand digger wasp	*Ammophila sabulosa*	##	##
Butterflies			
Common Jay	*Graphium doson*	##	##
Common Rose	*Atrophaneura hector*	##	##
Common Emigrant	*Catopsilia pomona*	##	##
Blue Tiger	*Tirumala limniace*	##	##
Aquatic Insects			
Giant Water Scorpion	*Ranatra elongate*	##	##
Water Back Swimmer	*Notonecta spp.*	##	##
Water Scavenger Beetle	*Berosus indicus*	##	##
Common Pond Skater	*Gerris lacustris*	##	##
Golden Darllet	*Ischnura auroa*	##	##
Burrowing mayfly	*Tortupus incretos*	##	##
Green Eyed Skimmer	*Capina lacustra*	##	##
Stone Flies	*Zapada wahkeena*	##	##

NB: *E = Endangered, V = Vulnerable, ## = Not mentioned in* Schedule of Species list in WPA (1972) and IUCN Category (WII-2012)

3.10.5 Findings:

There are 13 mammals, 10 reptiles, 14 birds, 4 amphibians and 27 fishes species are present in the study area. During our study period, we also identified a few insects out of which 5 species are of beetles, 3 are of ants, 4 are of butterflies. Besides these above, 8 species of aquatic insects are also identified. Among these animals, only 3 species belongs to Schedule–I category according to Wildlife Protection Act of India. All Schedule–I species mentioned in the above list are biologically threatened in their survival status. In our study area the threatened species are *Elephas maximus* (Elephant- Hati; in IUCN red list 2008 categorized as endangered), *Melursus ursinus* (Bear Bhalu; in IUCN red list 2008 categorized

as vulnerable) and *Python molurus* (Indian Python – Ajagar; in IUCN red list 2008 categorized as vulnerable).

Sloth Bear (***Melursus ursinus***) is recognized as a scavenger. Sloth Bears are found in Birasal RF existing in the ZoI of the Project area. During interrogation with villagers of Ribol and Kankadapal of Dhenkanal Forest Division, it was evident that Sloth Bears exist in the nearby forest. Also the villagers of Bamangad expressed that Sloth Bears are present in Mahagiri P.F. of Cuttack Division.



Sloth Bear (*Malursus ursinus*)

Bear normally dig ground for his food below the surface. Their long curved claws are always longer in their forefeet and act as good digging implements. By digging they collect tubers and suckers for their food. They have also a tendency on getting at insects which have tunneled into trees or underground. They also feed on insects. Breaking down the shelter the Bear draws its victims by suction. Nature has designed its snout for such work. Bears are well adopted to the forceful intake and explosion of air. Breaking den a termite mound with its claws, Sloth Bear with prodigious huffs and puffs blows away the dusts and debris and sucks the termite out of their gallery. The above discussion indicates that Sloth Bear is in the habit of eating up Suckers, Bulbs, Termites and insects. Therefore, Birasal R.F. should be well protected by deployment of watchers so that the ground condition will remain moist giving scope for development of suckers and bulbs and termites mound.



Jackal (*Canis aureus*)

Jackals (***Canis aureus***) are generally tolerant to the sun's heat and their habits are nevertheless influenced by temperature condition. They sick their food by day or by night are mere nocturnal in nature yet in the cold weather or in a cloudy day Jackals frequently come out to hunt even during day time. During hottest period of the day they remain under shelter. Jackals normally go out for hunting at the dusk and returned back to their den by dawn. They live in packs and are common in bare and open forest regions.

They feed on smaller ungulates, rabbits, hare and rodents. During dusk the pack produce hauling to produce intimate/communicate to the other pack about the commencement of their visit. They also practice the same while returning at the dawn. This is a good indication to the villagers about timing i.e. 5 PM /AM.

Of these three Schedule–I species, elephant need special attention being the flagship species. If the leader is protected rest wildlife can also be protected to live congenially. As an example, if the roof of a building will be protected, the whole house gets secured. For conservation of mega herbivore some of the requirements are:

1. **Habitat Restoration**:
    a. By raising Canal Bank Plantation with elephant qualifier species (List furnished separately).
    b. Providing protection to the elephants by engaging rural youth for at least 10 years to the forest like Birasal, Mahagiri and Tomka.
    c. To prevent fire incidence in the forest areas.
    d. To engage elephant trekkers to provide fast hand information to nearby forest staff and villagers about the presence of elephants.
    e. To strengthen the affected villagers by supplying crackers, gunny bags, diesel and use of cycle tyres to be used to depredate elephants and reduce damage to crop/house/human life.
    f. To provide solar fencing on the side of Birasal R.F. and Mahagiri D.P.F. for five months in a year i.e. from October- February to restrict crop depredation by elephant.
    g. To provide corpus fund with the DFO, Cuttack/ Dhenkanal to be used for giving compassionate amount to affected persons by elephants and to villagers whose crop field have been damaged by elephants as per recent guideline issued by Gazette Dt.:08.04.2011. (Copy Enclosed). For this purpose Rs. 100.0 lakhs with DFO, Dhenkanal and Rs. 100.0 lakhs with DFO, Cuttack to be allotted. So total Rs. 200.00 Lakhs will be provided to

respective DFO, by JICA. DFOs will utilize cost from this fund for compassionate payment to be made if any human wildlife conflict/damage istakes place. DFOs can also utilize this fund for providing crackers, hessian cloth, used cycle tyre, mobile, torch light, cost of beating of drums to villagers to scare the elephants, when the mega-fauna enter the village for crop raiding etc. Besides Funds for rescue of elephants in particular and other wildlife in general will be provided by Government of Odisha as per rules.

Periodically Census (in alternative year) of Schedule-I species is carried out by Wildlife Wing of State Forest Department pertaining to Elephant & migratory Birds. Till date no Census has been conducted for Sloth Bear, Jackal or other species as there is no practice of sensus in Odisha by wildlife department. For conservation and management point of view, it is also not possible to cover all the species under scientific management. Only Keystone / Flagship Species should be scientifically managed to conserve, in turns other species will get protection. Elephant is the keystone species here in the project and its impact area. So far the impact of LBC is concerned, the sighting of other species like bear & jackal is infrequent and construction of this canal will not impact on the habitat and movement of these species as Home Range of Sloth Bear and Jackal is very small compare to elephant. Rather the LBC with plantation on both banks will help in improving the habitat.

3.10.6 Other information:

The Left Bank Canal of Rengali Irrigation Project (Phase –I), from the starting of Canal RD 0.0 to RD 71.313 km in Dhenkanal Forest Division has already been executed. The completion of Phase–I has enriched agriculture around Kamakhyanagar area particularly the right side to the LBC, where the stakeholders are now producing more paddy during *kharif* season. Since the visit of the Experts was in *Kharif* season, no practical information of Rabi could be gathered directly from the field or secondarily from the villagers about the use of irrigation water for *rabi* crop. As on the date of last visit to the Project site, there was no water



Elephants crossing the road near Saruali

supply in the canal. The Assistant Engineer clarified that canal closure was advanced due to farmers request and water will be again allowed to flow in the canal if required for Rabi Crop.

3.10.7 Passage for Mega Herbivores:

From RD 54.0 km to RD 71.313 km, five elephant friendly ramps have been constructed along with two elephant overpasses, one at RD 54.352 km and the other at RD 58.69 km. Out of these five ramps at least one ramp constructed at GPS Co-ordinates 20^0 58′ 31.5″ N and 85^0 38′ 28.0″ E is being used by the elephants as the Random Rubble Masonry has been compressed giving an impression that it is due to elephant movement. The ramp width is on an average 4.5 meter with a slope gradient of 1**:** 4.5. In several places of the left and right embankments of LBC, there are evidences of elephant crossing over the canal even without using the ramps. Elephant normally move in herd of 6 to 9 nos. For their movement ramp of 6 m will be good enough. Elephant do not prefer straight ramp as shown in Picture 2 (Right). Rather they follow angular ramps shown in Picture -2 (Left). This enables them go down, drink water from canal & then go up in the same angle as they come down. In addition to that alignment along the canal ramp is better than straight aligned ramps because elephants seem to like edge of vertical stone masonry ramps and it causes to destruct canal bank. Therefore, we conclude that the width of the ramps should have been 6 metres and alignment should be opposite to one another on either side of the embankment. The over-pass which have been made in RD 58.69 km, is no doubt a magnificent architectural and structural masonry work perceived by Irrigation Engineers. This over pass connects two habitats i.e. Jiridamali RF on the right and Anantapur RF on the left bank of the LBC. The length and width of the over-pass is 70m and 50m respectively. Wing walls have been provided on both the side to guide the elephants to use the over-pass. The area has been camouflaged by plantation using species like Bara (*Ficus benghalensis*), Sissoo (*Dalbergia sissoo*), Acacia (*Acacia auriculiformis*), Khair (*Acacia catechu*), Sunari (*Cassia fistula*) and Chankunda (*Cassia siamea*). Out of these plant species only Bara is an elephant qualifier spp.



RAMP ALIGNMENT ON RENGALI LBC



ELEPHANT EXPERT WITH JICA EXPERT ON FIELD



ELEPHANT FRIENDLY RAMP ON LBC, RENGALI

FOOTPRINT OF ELEPHANT



Table No. C3-20: Elephant Ramp, Crossing and Over pass with GPS Co-ordinates

Sl. No.	Elephant Ramp / crossing / over pass	GPS Coordinate		Reducing Distance (RD) in km
		Latitude	Longitude	
1.	Elephant crossing	20^0 58′ 16.6″	85^0 39′ 24.6″	64.200 to 63.200
2.	Elephant crossing	20^0 58′ 31.5″	85^0 38′ 28.0″	62.200 to 61.200
3.	Elephant Ramp	20^0 57′ 36.0″	85^0 36′ 31.4″	58.200 to 57.200
4.	Elephant over pass	20^0 57′ 08.2″	85^0 35′ 54.3″	57.200 to 56.200
5.	Elephant Ramp	20^0 56′ 32.9″	85^0 34′ 21.9″	54.200 to 53.200

Table No. C3-21: Plant and its parts Consumed by Elephants in Odisha

Local Name in Odia	Scientific Name	Order/ Family	Parts consumed
Simil	*Bombax ceiba*	Bombocaceae	Leaves and small stems
Dhaman	*Grewia teliaefolia*	Tiliaceae	Leaves
Kapasia	*Kydia calycina*	Malvaceae	Leaves
Habali	*Thespesia populnea*	Malvaceae	Leaves
Mrmuika	*Helicteres isora*	Sterculiaceae	Leaves
Genduli	*Sterculia urens*	Sterculiaceae	Leaves
Anla	*Emblica officinalis*	Euphorbiaceae	Leaves
Kasi	*Bredelia retusa*	Euphorbiaceae	Leaves
Manda	*Macaranga peltata*	Euphorbiaceae	Leaves
Pani Gambhar	*Trewia nudiflora*	Euphorbiaceae	Bark
Panasa	*Artocarpus heterophyllus*	Moraceae	Leaves, Barks and Fruits
Bara	*Ficus benghalensis*	Moraceae	Leaves and Barks
Dimiri	*Ficus glomerata*	Moraceae	Leaves and Fruits
Jari	*Ficus retusa*	Moraceae	Leaves and Branches
Aswastha	*Ficus religiosa*	Moraceae	Leaves and Branches
Sahara	*Streblus asper*	Moraceae	Leaves and Branches
Bel	*Aegle marmelos*	Rutaceae	Fruits
Kaitha	*Limonia acidissima*	Rutaceae	Bark and Fruits
Moi	*Lannea corromandelica*	Anacardiaceae	Leaves and Branches
Amba	*Mangifera indica*	Anacardiaceae	Fruits

Kusum	*Schleichera oleosa*	Sapindaceae	Leaves
Barakoli	*Zizyphus mauritiana*	Rhamnaceae	Leaves
Siali	*Bauhinia vahlii*	Leguminaceae	Leaves, Barks and Stems
Tentuli	*Tamrindus indica*	Caesepinaceae	Leaves and Fruits
Sunari	*Cassia fistula*	Caesepinaceae	Leaves and Stems
Gohira	*Acacia leucophloea*	Mimosaceae	Leaves
Palasa	*Butea monosperma*	Fabaceae	Leaves
Piasal	*Ptercarpus marsupium*	Fabaceae	Leaves
Jamun	*Syzygium cumini*	Combretaceae	Leaves
Kumbhi	*Careya arborea*	Lecythidaceae	Leaves and Fruits

In association with Forest personnel, the Irrigation department engineers should interplant species like Bara (*Ficus benghalensis*), Jari (*Ficus retusa*), Karanja (*Pongamia glabra*) Pahadi sisoo (*Dalbergia latifolia*), Piasal (*Pterocarpus marsupium*) Dhaura (*Anogeissus latifolia*) etc. which will attract elephants to make best use of the Over-pass constructed at RD 58.69 km. The other over pass of RD 54.352 km is now under construction, which should also be provided with vegetation cover by seeding grass on the floor and planting species on the extended canal bank on both sides, as mentioned above. This means the civil works has been completed but the ecological suitability has not been adequately incorporated. On the date of the last visit i.e on 13.11.2013 a local villager returning from his paddy field on a by-cycle met our team including JICA expert namely Mr H Watanabe. The villager admitted that 2-3 years back a herd of 4-6 elephant have used this overpass. Probably this is the 2nd canal over pass in the Country. The earlier one has been constructed at Chilla-motichur presently in Uttarakhand, which is being used by elephants.



ELEPHANT OVER PASS NEAR RD 58.20



3.10.8 Present Canal Bank Plantation already done in Phase I:

The canal bank plantation made by State Forest Department using species like Bara (*Ficus benghalensis*) Kadamba (*Neolamarckia cadamba*) Sisoo (*Dalbergia sissoo*), Neem (*Azadirchta indica*), Chakunda (*Cassia siamea*), Sunajhari (*Acacia auriculiformi)*, (*Acacia holosersia*), Cashew (*Anacardium occidentale*), Mahal (*Ailanthus excelsa*) etc. Due to non accessibility to the left bank, the plants are surviving. But the plants of right embankment have been badly damaged by local villagers, who use the same as fire-wood. It is evident that the Cashew plantation on the left embankment is providing shelter to elephants during day time.

3.10.9 Sensitive areas – locational distance & discussions:

The nearest Wildlife Sanctuary is Hadagarh Wildlife Sanctuary (HWS), about 13.0 km from the Project Site, which is rich in biodiversity and is situated to Eastern part to the Project Site.

Fig.No.C3-14: Eco-sensitive Map of Odisha

3.11 SOCIO – ECONOMIC ENVIRONMENT:

Socio-economic survey of the study area was carried out to assess the status of existing demographic pattern and general amenities based on the secondary information available with different Government agencies.

Socio-economic study of a particular study area indicates the levels of socio-economic status that already exists and what could be the possible achievements during subsequent years after implementation of the project. The socio-economic development is a value-added concept and there should not be a consensus as to its meaning and should have the option of application and its implementation in multiple way to achieve the ultimate goal.

The socio-economic development has multiple dimensions such as economic status, social placement, availability and utilization of basic amenities, working pattern and work category etc and the development could be conceptualized as a set or vector of desirable social objectives or a development index.This study includes the aspects of demographic profile with respect to rural base, classification of male, female, S.C., S.T and working class pattern in the study area. In addition to this, the study covers the literacy level, availability of basic amenities like medical and education.

Urbanization has brought some changes in the settlement patterns as well as the social make up of the people of this area. A number of villages have increased in size. This increase in the population size of the villages was more due to the immigrants who came searching for the economic succor. This has changed the character of the villages from homogeneity of a single tribe or caste to heterogeneous.

The socio-economic profile of the study area is presented based on the secondary data available from District Census Hand Books for Census 2001 & furnished in **Annexure No. IX**.

Another sample Socio-economic survey was conducted in 15 villages covering all (137) displaced families (DFs) and in 10 villages for 209 affected families (AFs) of LBC-II, Phase–II of Rengali Irrigation project in Dhenkanal, Jajpur and Keonjhor district in consonance with the Government of Odisha for Resettlement and Rehabilitation Policy, 2006. The summary of the study is furnished in **Annexure No. X.**

The objective of the sample study was to establish social inventory of the affected villages; to assess the households' loss of production from the land likely to be acquired by the project, the extent of possession of immovable properties like houses, wells, ponds, trees etc. from every DF /AF, the perception of the people, who are likely to be affected, towards the implementation of the project in the said area and to identify the Common Property Resources (CPRs) and the extent of their getting affected due to such acquisition.

3.11.1 Demography:

The status of demographic profile in the study area has been a reflection of Census 2011. The demographic profile study of a particular area gives a picture to visualize the status of population i.e. male population, female population, no. of households and their occupation. The sex ratio of male and female are also the part of the study which represents a futuristic assessment for balancing the ratio for a biological sustainability. The work force particularly in rural areas is sometimes categorized based on their occupation and some are also identified on the basis of their caste. The statistical data available in the 2001 Census gives a clear status of the baseline level and which in turn helps to predict and plan for any development under different schemes of the state Govt.

The socio-economic profile of the study area is presented based the secondary data available from District Census Hand Books for Census 2001 & furnished in **Annexure No. IX**.

There are about 621 benefitted villages found in the ayacut area, which is the study area. These villages belong to three districts namely Dhenkanal, Jajpur & Keonjhar. The demography table is designed mainly on the basis of population of three Category of Castes i.e. Scheduled Caste (SC), Scheduled Tribe (ST) & Rest belong to General Category. Each category is again sub−divided into Male & Female category.

It is inferred that four villages of Dhenkanal districts & one village of Jajpur district belong to only ST category population. Similarly, looking at the villages having only SC population, it is found to be two in Dhenkanal, six in Jajpur & one in Keonjhar district. Likewise, in case of General category population, there are four villages in Dhenkanal, 21 and 15 villages in Jajpur & Keonjhar district respectively. These will be considered as homogenous villages as because the whole population of the respective villages belongs to only one caste. In total

there are 54 Homogenous villages in the ayacut of which 10 villages belong to Dhenkanal 28 villages to Jajpur & 16 villages to Keonjhar. On the other hand, there are five ST villages nine SC villages & 40 Villages of general Caste exist in the ayacut. With slight change in the definition of homogenous villages from 100% single caste group to => 90%, then the quantum of homogenous villages will increase. This change in percentage will not be found to have much variation in the definition of "Homogenous" because practically, the rest population of <10% may be one or two families of other caste. With this consideration, i.e. => 90% ST habitations are observed to be 6 in Dhenkanal, 12 in Jajpur & seven in Keonjhar districts which combinely gives rise to 25 no.s habitation. Similarly, one, eight, & six SC villages found in Dhenkanal, Jajpur and Keonjhar district respectively. In case of General Caste eight Villages found to be in Dhenkanal, 22 Villages in Jajpur & Keonjhar district. Combining these habitations, there are 92 villages having =>90% population of independent Caste group. The discussions done above are related to homogenous villages. Since all villages are not homogenous, therefore, there must be heterogeneous villages. In these villages the three caste groups may be present in different proportions. In case, one Caste group is comparatively more than the other two then that caste group is considered to be dominated over others, with this consideration in the present case the dominance factor is considered to be =>70% and <90% population of a single caste. Considering the above criteria of dominance factor, there are four ST villages in Dhenkanal, eight in Jajpur & 15 in Keonjhar Districts. Looking at SC category dominance, it is found to be two Villages in Dhenkanal & five each in Jajpur and Keonjhar district. Similarly 28 Villages of general caste dominated over other two groups in Dhenkanal districts and 96 & 30 villages in Jajpur & Keonjhar district respectively.

Within these heterogeneous villages, there may exist two castes groups i.e. non-existence of third category of caste group. Under this category, there are 28 villages in Dhenkanal, 149 villages in Jajpur & 64 villages in Keonjhar have no ST population. Similarly there are 17, 37 & 31 habitations in Dhenkanal, Jajpur & Keonjhar districts respectively having no SC families. Seven Villages in Jajpur & Keonjhar have no general category people.

3.11.2 Literacy:

57% villages of each district of the ayacut have illiterates < 30%. 10% villages of Dhenkanal, 12% of Jajpur & 17% villages of Keonjhar district are having 20% illiterate. The highest literacy percentage is 86.36% in Village Balipada in

Dhenkanal district. This is a small village having population of 22, including 3 children of less than six years. If these three children will be excluded, because they have not attained the age to be educated, the village will have 100% literates. The people of this village belong to general Caste. The lowest literacy percentage in this district is 31.85 which is in village Kendupada, a "ST" dominated Village.

In Jajpur district the highest literacy rate 89.97% which is in village Biridiha, where approximately 70% population belong to general caste, and rest are SC except 0.28% ST population. The lowest literacy rate is 16.5 observed in Jemadeipur village where 96.86% people belong to ST Category. Similarly the highest literacy percentage in Keonjhar districts is 90.43, in village's Malikatina, where the whole population belongs to general caste and the lowest percentage is 8.69 in village Naduan, which is also a general category village. It can be concluded from above analysis that all the highest literate villages composes of general caste peoples the lowest literates are ST people.

3.11.3 Occupation pattern:

The occupation pattern was considered under four categories, i.e. cultivators, agricultural, household industry and other workers. The information gathered from the census data for the above occupational pattern are analysed districtwise mainly on the basis female participation and are mentioned below.

DHENKANAL DISTRICT:

- Involvement of Females population is 3.68% that of of male in case of cultivators.
- Female participation is 28.97% of male in agricultural.
- Presence of female in household industry category is 14.10% of male.
- In other workers category female population having 12.72% of male are present.

- 39 (43.8%) villages of Dhenkanal district having nil female participation in cultivators group. 44 (49.4%) villages of Dhenkanal district show that participation of female population have more than 0 and less than 10 in cultivators and Involvement of female population ≥10 in cultivators is found in 5 (5.62%) villages.

- No females participated in 15 (16.85%) villages of Dhenkanal district in agriculture where as participation of female population having more than 0 and less than 10 is found in 28(31.46%) villages. In 45(50.56%) villages, involvement of female population seems to be more than and equal to 10 in agricultures.

- In household industry group 53 (59.55%) villages of Dhenkanal district have no involvement of female population and in 29(32.58%) villages female participation is between zero and ten. Female population having more than and equal to ten are present in 6(6.74%) villages under the same category.

- 4 (4.49%) villages of Dhenkanal district have no involvement of female population in other workers group where as in 40(44.94%) villages invovement of female population is in between zero and ten in the same category. Villages where active participation of females seems to be more than and equal to ten is 44(49.44%).

KEONJHAR DISTRICT:

- Female participation is 4.47% that of male in cultivators.
- Female participation is 42.63% that of male in agricultural.
- Female participation is 32.96% that of male in household industry.
- Female participation is 17.73% that of male in other workers.

Female participation in occupation in no.of villages**:**

Female participation	**Cultivators** in No.of villages	**Agricultures** in No.of villages	**Household** in No.of villages	**other workers** in No.of villages
Nil	38(23.89%)	23(14.47%)	115 (72.32%)	13(8.18%)
>0<10	103(64.78%)	76(47.79%)	39(24.52%)	87(54.72%)
≥10	18(11.32%)	60(37.74%)	5 (3.14%)	59(37.11%)

JAJPUR DISTRICT:

- Female participation is 8.55% that of male in cultivators.
- Female participation is 20.73% that of male in agricultural.
- Female participation is 19.46% that of male in household industry.
- Female participation is 16.38% that of male in other workers.

Female participation in occupation (Jajpur)

Female participation	**Cultivators** in No.of villages	**Agriculture workers** in No.of villages	**Household workers** in No.of villages	**other workers** in No.of villages
Nil	129(34.58%)	81(21.72%)	254(68.09%)	47(12.60%)
>0<10	201(53.89%)	156 (41.82%)	99(26.54%)	180(48.26%)
≥10	43 (11.53%)	136(36.46%)	20(5.36%)	146(39.14%)

3.11.4 Employment:

Like occupation, the employment data was also acquired from census and similarly, four categories of workers group are observed over here. Participation of female as compared to male in various types of employment is reflected here.

Dhenkanal district:

- In working population category 17.74% of mail are female.
- In main worker category 7.67 % of male are female.
- In marginal worker category 42.51 % of male are female.
- In non worker category 188.58% of male are female.

Female participation in employement (Dhenkanal)

Female participation	**Working population** in No.of villages	**Main worker** in No.of villages	**Marginal worker** in No.of villages	**Non worker** in No.of villages
Nil	0 (0%)	7 (7.87%)	7(7.87%)	0 (0%)
>0<10	17(19.10%)	44(49.44%)	20(22.47%)	2(2.25%)
≥10	71(79.77%)	37(41.57%)	61(68.54%)	86(96.63%)

. **Keonjhar district:**

- In working population category 19.89% of mail are female.
- In main worker category 9.19% of male are female.
- In marginal worker category 52.79% of male are female.
- In non worker category 188.91% of male are female.

Female participation in employement (Keonjhar)

Female participation	**Working population** in No.of villages	**Main worker** in No.of villages	**Marginal worker** in No.of villages	**Non worker** in No.of villages
Nil	4(2.52%)	5 (3.14%)	41(25.79%)	0(0%)
>0<10	39(24.53%)	67(42.14%)	55(34.59%)	0(0%)
≥10	116(72.96%)	87 (54.72%)	63(39.62%)	159(100%)

Jajpur district:

- In working population category 15.55% of mail are female.
- In main worker category 8.67 % of male are female.
- In marginal worker category 41.57% of male are female.
- In non worker category 190.54% of male are female.

Female participation in employement (Jajpur)

Female participation	**Working population** in No.of villages	**Main worker** in No.of villages	**Marginal worker** in No.of villages	**Non worker** in No.of villages
Nil	17(4.56%)	30(8.04%)	80 (21.45%)	0(0%)
>0<10	116(31.09%)	159(42.63%)	148(39.68%)	4(1.07%)
≥10	240 (64.34%)	184(49.33%)	145(38.87%)	369(98.93%)

3.12 List of village infrastructures affected due to LBC from 71.313 km to 141.00 km

Sl. No.	Village	Compensation/ Resettlement necessary					
		Samadhi	Well	Pond	School	Mandap	Trees
1	Madhapur	2	3	0	0	0	67
2	Sansailo	0	0	0	0	0	
3	Sansailo	8	0	0	0	0	13
4	Dhamanagadia	2	1	1	0	0	99
5	Nadiabhanga	0	0	0	0	0	121
6	Sulia	0	0	0	0	0	31
7	Ragada	0	0	0	0	0	25
8	Salijanga	0	1	0	0	0	136
9	Nohuranipokhari	0	0	1	0	0	
10	Talagaon	0	0	0	0	0	7
11	Biragovindpur	0	0	0	0	0	44
12	Khamigaon	0	0	0	1	0	
13	Gorigoth	0	0	0	1	0	
Total		**12**	**5**	**2**	**2**	**0**	**543**

3.12.1 No. of affected Land owners, Household, Squatters etc.

Sl. No.	Name of the Canal	No. of affected families	Compensation/Resettlement necessary			Already compensated			Balance		
			Land in Ac.	House hold no.s	Squatters no.s	Land in Ac.	House hold no.s	Squatters no.s	Land in Ac.	House hold no.s	Squatters no.s
1	Sub- Total of LBC (71.313 to 100.49 km)	10469	1834.99	111	66	466.86	56	66	1368.13	55	0
2	Sub- Total of LBC (100.49 to 141.00 km)	1799	844.51	29	112	81.61	0	0	762.9	29	112
3	Sub - Total of Distributaries (100.49 to 141.00 km)	14142	3029.51	35	26	0	0	0	3029.5	35	26
	Grand Total	**26410**	**5709.01**	**175**	**204**	**548.47**	**56**	**66**	**5160.5**	**119**	**138**

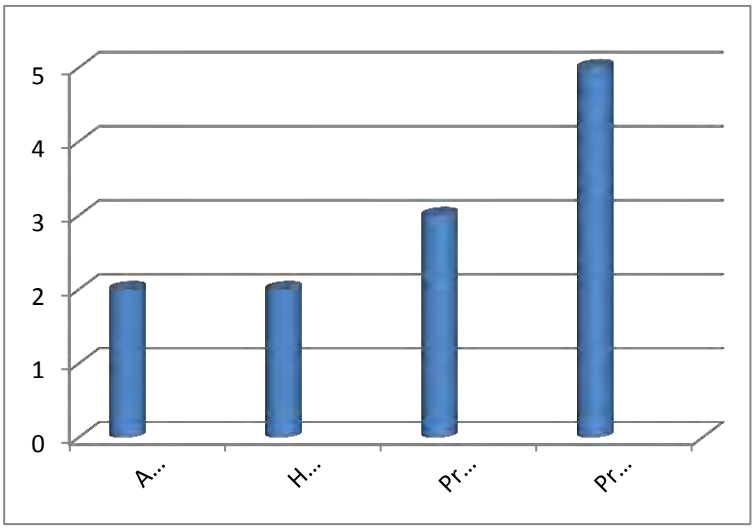
3.13 AMENITIES:

The three districts coming under the study area have the provision of various types of amenities. Amenities or facilities those are considered here to analyse are medical, education and water facilities and the findings of each of these facilities are described below under different districts.

3.13.1 Medical Facilities:

In Dhenkanal District

- There exists no hospital of any kind i.e. Allopathic, Ayurvedic, Unani or Homeopathic in the study area of Dhenkanal district.
- However, two Ayurvedic Dispensaries, one in each village, are available at Kanapalsamil mahulpal and Anala village.

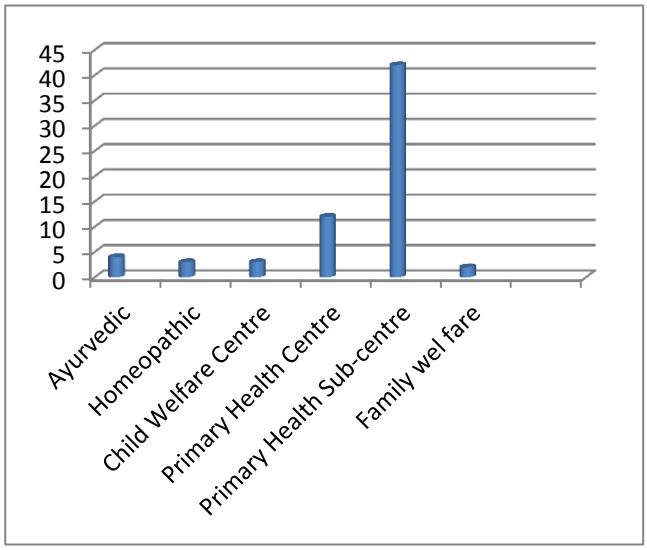


- Similarly, two Homeopathic Dispensaries, one in each village, is found at Kingol and Dhalapada village.
- Primary Health Centers (PHC) are available at Mrudanga, Baruan and Odisha.

- Nine Primary Health Sub-Centres (PHSC) are providing services in ektali (kha), Kingol, Surapratappur, Balibo (L), Garhnursinghaprasad, Davanavili, Baruan, Dhalapara.
- Based on data the hospital facility in this area is considered to be poor.

In Jajpur District

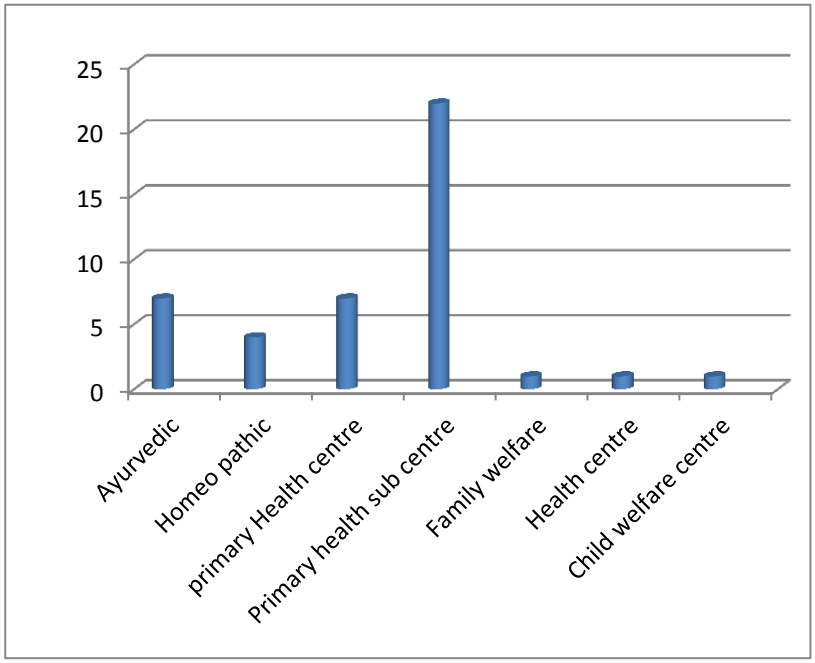
- There seems to be no hospitals of any kind i.e. Allopathic, Ayurvedic, Unani or Homoeopathy found in the study area of Jajpur district.
- Ayurvedic dispensaries are available in 4 villages only.
- Homeopathic dispensaries are found three villages i.e., at Rampilo,Upulei and Kumbhirigadia.
- Maternity centers are not available where as Child welfare centres are located in two villages namely Barundai, Nizigarh.
- 12 Primary Health Centres and 42 Primary Health Sub-centres are providing health services in the study area of this district.
- Two Family Welfare Centres, one in each village, are available at Barundei and Nizigarh.



In Keonjhar District:

- There seems to be no hospitals of any kind i.e. Allopathic, Ayurvedic, Unani or Homoeopathy found in the study area of Keonjhar district.
- Seven Ayurvedic dispensaries are located in different villages.
- Homeopathic dispensaries are present at 4 villages.
- Only one Child Welfare Center and one Health Centre are found in village Sainkul.

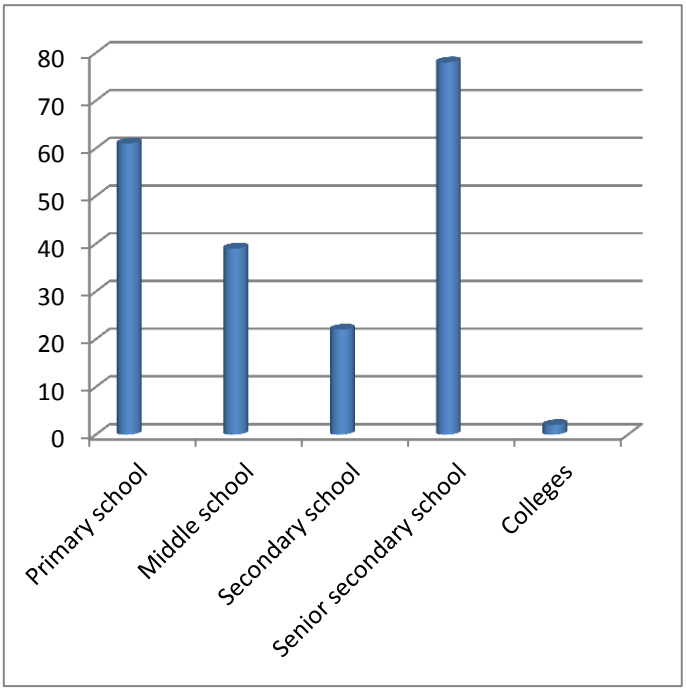
- Seven Primary Health Centres are sited in different villages to cater health services.
- Primary Health Sub-Centres are also available at 27 villages.
- Besides, one Family Welfare Center is placed at village Sainkul.



3.13.2 Educational Facilities:

In Dhenkanal District:

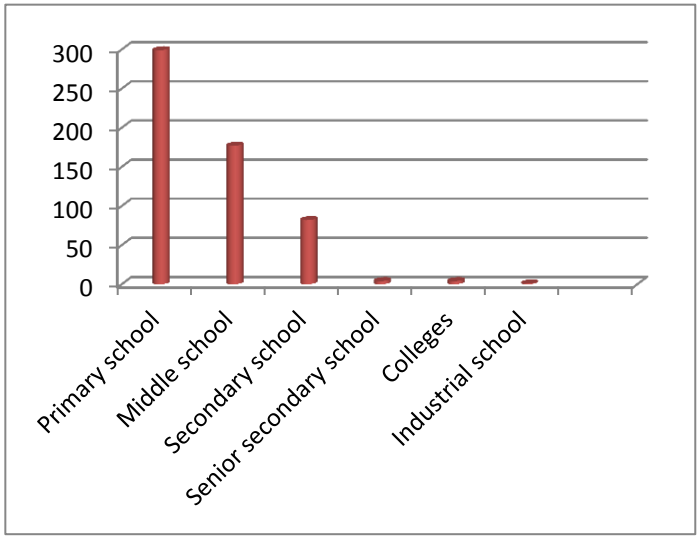
The educational facilities available in the project villages of Dhenkanal district are:



- 61 Primary schools are present in villages of study area i.e. Primary school facility is mostly available throughout the ayacut area of Dhenkanal district.
- 39 Middle schools exist in study area of the said district which seems 50% of total villages are covered with Middle schools.
- Out of 78 villages of Dhenkanal district in the study area, 23 villages are having secondary schools.
- Existence of Senior Secondary Schools found in two villages i.e., Mrudanga and Baruan.
- Two colleges are also present in the same two villages where Senior Secondary Schools located, i.e. Mrudanga and Baruan village.

- Any Industrial school, Training school, Adult literacy class and other educational facilities are not found in this section of the study area.

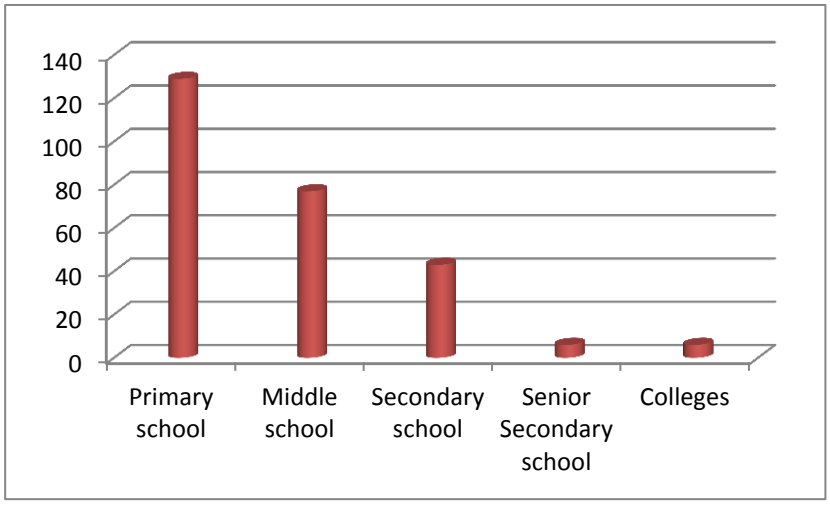
In Jajpur District:



- Out of 373 villages 299 villages in the study area have primary schools.
- 177 villages in the study area have middle schools.
- Secondary Schools are located in 82villages in the study area.
- Only 4 villages in the study area of this district have found to be senior secondary schools.
- Colleges are placed in four villages in the study area.
- The only Industrial School is sited in village Rampilo.
- Training schools and other literacy centers are not available at any villages.

In Keonjhar District:

- 129 villages in the study area have primary schools.
- 80 villages in the study area have middle schools.
- 43 villages in the study area have secondary schools.

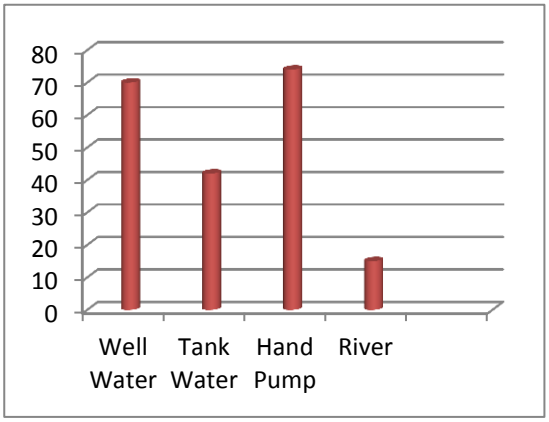


- Only 6 villages in the study area have senior secondary schools.
- There are only 6 villages in the study area having colleges.
- There are no Industrial school, Training school, Adult literacy class and other educational facilities in the study area of this district.

3.13.3 Water facilities:

In DhenkanalDistrict:

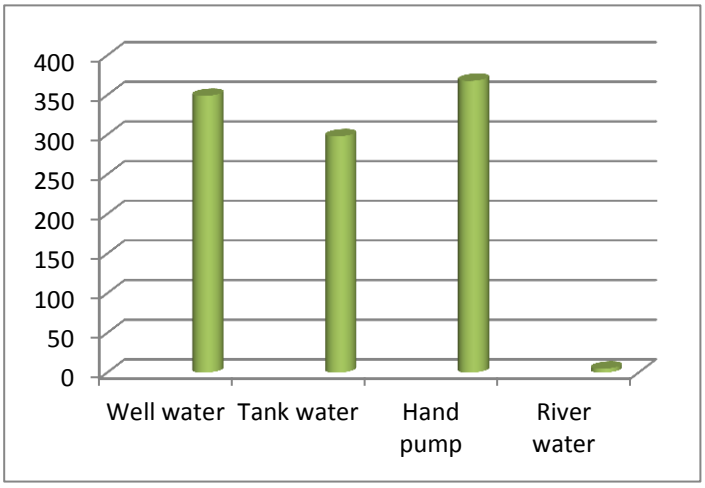
- Tap water facility does not present in any villages.
- 70 wells are found in different villages of the study area of Dhenkanal district.
- 42 Tanks are existing in this area.
- All most all villages are provided with tubewell Hand pumps for drinking water purpose.



- River water is being used by 15 villages for various purposes.

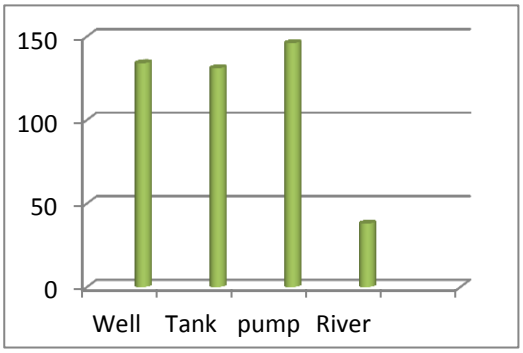
In Jajpur District:

- 349 Wells are present in different villages of the study area of this district.
- 298 tanks are distributed in different villages through out the project area of the district.
- All villages are provided with hand pumps for drinking water purposes.
- People are dependent on river water in 34 villages for various uses.



In Keonjhar District:

- 134 wells are found in different villages of the study area.
- 131 tanks are located in different parts of the study area.
- Provision of drinking water is available to all villages through hand pumps.
- River water is also being used for various purposes in 38 villages.



3.14 SOCIAL ENVIRONMENT (SE) and RRP REPORT BASED ON FIELD SURVEY:

Exhaustive study of SE & RRP, which involves elaborate field survey and social inventory for preparation of RRP, require protracted time factor to negotiate large magnitude of work covering 621 ayacut villages under 3 districts of odisha. For the project appraisal purpose by the DoWR within a limited time frame; expedient action as agreed in the JICA's TOR included preparation of RRP by conducting sample survey of representative villages.

Accordingly, the study under the mentioned scope was segregated and entrusted to another credible organization namely **XIMB** [Xavier Institute of Management Bhubaneswar] to carry out independent socio-economic study in association with OCCL.

Summary of XIMB's field survey, findings and relevant recommendations for RRP; as received through the project authorities; is appended in **Annexure No. X** which need to be consulted in conjunction with various in formations given in this EIA report.

3.15 SENSITIVE RECEPTORS:

Development projects intended for providing Socio-economic benefits to the people often interferes with the existing Social infrastructure and may cast negative impacts for some sensitive receptors of the region.

During the baseline survey of the study area for Rengali Left Bank Canal project (LBC–II Phase-II) some sensitive receptors, like school, college, medical institutes and old age names have been identified.

3.15.1 Identification of sensitive Receptors:

Strategy:

- Identification of Sensitive receptors along the main canal alignment (LBC-II Phase-II) was focussed during the baseline survey.
- The project induced influence is zoned under 7 segments. The zoning category are,
  I. **Highly influenced zone**: Villages & Village wise sensitive receptors appearing within 500mt offsets at both sides of the main canal alignment.
  II. **Moderately influenced zone**: Villages and Receptors appearing further of 500m i.e. between 500m to 1000 m. offsets at both sides of the main canal alignment.

- Impact on receptors for highly influenced zone is considered significant for taking up mitigation measures.

3.15.2 List of Sensitive Receptors:

- List of Villages along with village wise sensitive receptors appearing in the project influence zone are furnished in Table No. C3-22.

Table No. C3-22: List of Villages & sensitive receptors in the project influenced zone

Left side of main canal								Right side of main canal					
Distance in km		Sensitive Receptors						Sensitive Receptors					
		Within 500 m from main canal			Between 500 – 1000 m from main canal			Within 500 m from main canal			Between 500 – 1000 m from main canal		
From	To	Village	School	Medical Facility	Village	School	Medical Facility	Village	School	Medical Facility	Village	School	Medical Facility
70	80				Rankia Kusumdia Telibrha	1 1 2		Anala	3				
80	90	Pimpurhia Kantapal Natisahi	3 1 4	 1	Bandhagaon Patapur	3 2		Nuadihi	2		Manatira	1	1
90	100				Panaspal	3		Madhapur	1				
100	110	Shulia Ranagundi	3 1	 1	Ranapur	3		Nadiabhanga	3		Narada	4	
110	120	Raghabpur	1		Nilakanthapur Bangarkota	1 3	 2				Ragarha	2	
120	130							Nachhipura Santaragarhia Deogaon. Nuapada Balarampur	3 1 1 1 3				
130	140							Gohira	3	1			

Table No. C3-23: Abstract list of Sensitive Receptors

Sl.	Particulars	No. of Villages	No. of Schools	No. of Medical Facilities	No. of Old age Homes
1.	**Left side of LBC**				
	i. Offset up to 500 m	6	8	2	Nil
	ii. Offset between 500m to 1000 m	9	19	2	Nil
2.	**Right Side of LBC**				
	i. Off set up to 500 m	10	21	1	Nil
	ii. Offset between 500 m to 1000 m	3	7	1	Nil

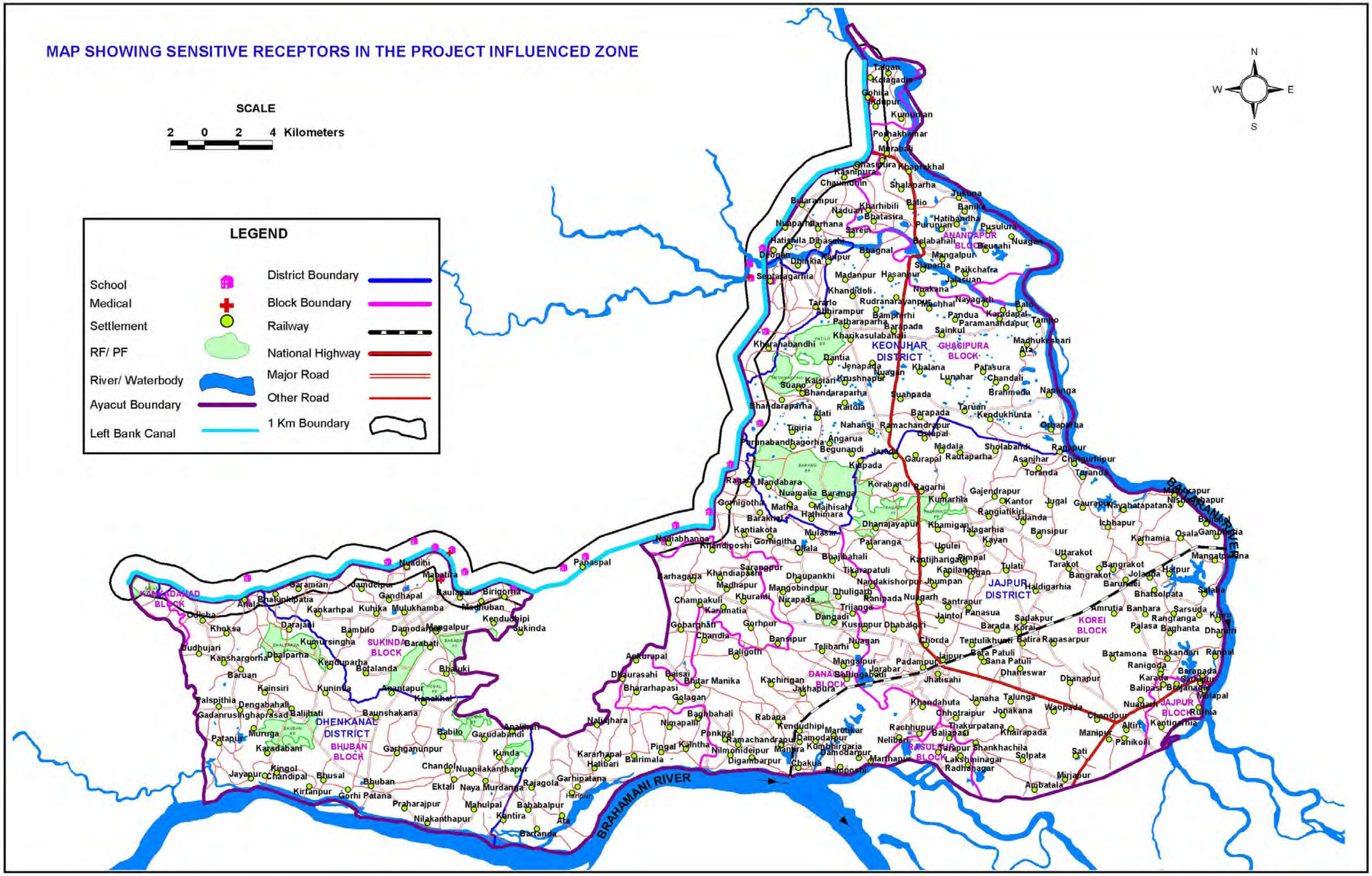


Fig.No.C3-15: Sensitive Receptor map of the Study area

CHAPTER - 4
ENVIRONMENTAL SCOPING OF EIA ITEMS

4.1 ENVIRONMENTAL SCOPING OF EIA ITEMS:

In the assessment of environmental impacts for the study area; sub project Rengali Irrigation LBC-II Phase-II, priority has been given to the scoping process to select significant environmental parameters for study which to be recommended procedure of Environmental Impact Assessment.

After the baseline assessment of existing environmental conditions of the project, scoping of items for various environmental attributes need to be charted out scrupulously to carry out the Impact assessment study.

4.1.1 Environmental Screening Category:

Decision of selecting various environmental issues / items is regulated according to the screening category of this sub-project. In this context, JICA's Environmental Guidelines 2010 is referred for the categorisation system in JICA.

Box No. 7: Categorisation system in JICA

Category A	Projects which are likely to have significant impact on environment & Society. It includes projects in sensitive sectors or with sensitive characteristics and projects located in or near Sensitive areas.
Category B	Projects with potential adverse impacts on the environment & Society less adverse than those of Category 'A' projects.
Category C	Projects which have minimal or little adverse impacts on the environment & society.

JICA have considered this subproject LBC-II Phase-II (Ayacut 72964 ha) as category – A Projects. The scope of EIA items has been decided accordingly & as per the Terms of Reference (ToR) finalized by JICA's expert team on 7th October 2013.

4.1.2 Scoping of EIA Items:

The following activities determine the scope for EIA Study:

- Baseline Assessment Data for scoping
- Environmental Impact items with significance of each.
- Review of guidelines and support system for EIA study.

4.1.3 Baseline Assessment Data for scoping:

- Baseline survey of the pre-project environmental conditions has been conducted by the experts during the period August 2013 to October 2013 covering relevant parameters for the monsoon season and the post-monsoon season.
- Recommended guidelines were followed for Field sampling of soil and water, field survey for Air, Noise, Natural environment [Forest and Wildlife] and Socio-economy status of the study area.
- Base line data thus comprised of
  - All primary data from Laboratory Test results
  - Secondary data from authentic records maintained by National / State level organisations as well as project data books.
  - Literature Consultation
  - Consultation with local people / NGOs & SHGs
  - The Baseline survey of all the relevant environmental attributes comprising of survey locations; Process descriptions, results of the field survey and laboratory test as well as data from literature / record consultations are detailed in Chapter – 3 of this document.

4.1.3.1 Environmental Impact Items with attached significance for each item:

The general criteria considered for selection of significant Impact items includes; Area of Impact; Duration of Impact; cumulative effect and the extent to which the impact may be reversible.

Box No. 8: Criteria for determining degree of importance of Impacts

Factors	Slightly Important	Fairly Important	Most Important
Area Affected	No change in pre-project value.	More than double of pre project area.	Impact transcends the country region boundary
Duration	Up to pre-construction phase	Up to construction phase	Up to and including operation phase
Intensity	Within the standards prescribed	Within tolerance limit but exceeding prescribed standards	Always exceeds the tolerance limit
Cumulative effect	Impact is reduced due to interaction of impacts. No cumulative impact	Accumulation followed by periodical reduction	The accumulation is fast and intense and harmful
Reversibility	Impact is completely reversible	The Impact is irreversible	The impact is irreversible; as high intensity and is harmful

Source: *"Guidelines for Sustainable Water Resource Development & Management" by WAPCOS (1992)*

4.1.3.2 Checklist information on Baseline Data:

Table No. C4-1: Prediction of Impact concerning Environmental Pollution

Items	Baseline data / Survey findings	Importance of Impact
Air pollution	• Survey conducted in 9 stations • PM_{10}, $PM_{2.5}$, SO_2, NOx are well within permissible limits	Slightly important during construction period only
Surface water Quality	• Sample collected from 6 stations • Analysed • Parameters are within the CPCB Standard.	Minimum impact on water pollution
Ground water quality	• Sample collected & analysed from 4 stations • Parameters are within the CPCB Standard.	Minimum impact on water pollution
Ground water level fluctuation	• Measured at 21 locations • Water levels are very close to the ground level during post monsoon while it goes beyond 8 or 9 m below ground level.	Possibilities of increase in Ground water level after irrigation
Noise Level	Monitored in 9 locations & levels are not exceeded the ambient noise standard.	Slightly important during tunnel construction period
Vibration	Vibration levels monitored in 3 locations & vibration level within the range.	Slightly important during tunnel construction period
Soil Quality	Samples collected in 9 locations & analysed. Overall the soil of study area is suitable for agriculture.	Minimum impact
Meteorology	Data generated from IMD stations & wind rose prepared.	Slightly important during construction period only

Table No. C4-2: Prediction of Impact concerning Natural Environment

Sl. No	Item Description	Baseline data / Survey Findings	Significance of Impact	Counter measures Required
1	**Protected Area**	• Sensitive Receptors in study area identified @ 500m & 1000m at both flanks of LBC • Does not include locations reserved for ethnic people or any area designated for cultural heritage. • Development institutions sporadically noticed	• Impact for a short lived period • Localised • Fairly important	Mitigation measure during the construction phase.
2 i.	**Eco- System** Geographical Features i.e. significant change in land use/ land cover	• A very small part of natural Forest (Birasal RF) will be affected. • No ecologically important habitats encountered / disturbed.	• Slightly important	Environmental up-gradation to improve **landscape**
ii.	Soil Erosion	• No significant impact on existing soil stability.	• Slightly important	Mitigation measure like canal lining plantation proposed
iii.	Terrestrial Biota i.e. Flora – Fauna and endangered species.	• Common species of flora and fauna found in the sub-deciduous forest • No endangered species of flora noticed	• Species found in adjacent forests • Reversible impact • Slightly	• Replenishment of felled floral species by plantation • To maintain Bio-diversity

		• Only 3 species of schedule – I Category fauna found	important	
iv.	Wildlife movement i.e. Elephant passages.	• Mitigation route of mega-herbivores (Elephants) are noticed at 3 locations	• Most important	• Management plan involving elephant crossing.
3	**Hydrology**	• Water for irrigation to be supplied from river source (Samal Barrage on River Brahmani) • Sustainable hydrology • Water pollution anticipated	• Slightly important • Intensity within the prescribed standards	• Mitigation measures and Monitoring activities proposed
4	**Landscape Management** i.e. management of abandoned sited after construction.	• Duration of Impact limited to construction period. • Impact locations identified as ▪ Borrow areas ▪ Quarry pockets ▪ Construction sites	• Fairly important as impact experienced up to end of construction phase.	• Mitigation measures proposed • Backfilling of Borrow areas & quarry policy • Area levelling and effective solid disposal method.
5	Environmental pollution concerning Air, water Noise, Vibration & Soil etc.	• Ambient quality parameters are within permissible standards • Adverse impact anticipated due to project implementation	• Fairly important	• To be monitored throughout the project period.

Table No. C4-3: Impact on social Environment

Sl. No	Items	Baseline data/ survey findings	Significance	Mitigation measures proposed
1	Involuntary Resettlement	Displacement mostly involves squatters (204 no.s Families)	Fairly Important	Displacement & Payment of compensation as per R&R policy 2013
2	Land Scape and utilization of local resources	Existing 72967 ha rainfed cultivable land will be converted to irrigated agriculture with multi crop production.	Most important positive impact	Through CAD & WM Programme to be undertaken
3	Local economic i.e. livelihood and employment status	• Uncertainty in crop output due to unpredictable monsoon effect	Most Important	• Adopt scientific methods of Irrigation • Involve DAO & WUA's & NGO's • Member status
4	Cultural heritage	No significant Historical Monuments or cultural heritage affected		
5	Ethnic minorities and Indigenous people (Group)	Tribal Population ** 14.6% S.C and Others 85.4%	Fairly Important	Priority should be attached to ethnic group during rehabilitation, land compensation & employment opportunity.

6	Occupational status in command area	Cultivators 9% ** Agricultural 10% Household workers 1.1 % Other workers 11.2%	Fairly important	
7	Public Health	• Endemic health problem is Malaria • Water borne diseases may appear in high water use areas due to water pollution • Poor drinking water facilities	Most Important	• Important Health Delivery plan • Involve state DHS
8	Infrastructure facilities	Impact anticipated on existing roads, transport, drainage, sanitation, drinking water, plantations etc. as well as other Govt. Development structures.	Fairly Important	To be improved as per the clients Social Responsibility Scheme.
9	Consultation with stakeholders	Stakeholders consultation meetings held which have consented for the project implementation.	Positive impact	Periodic Consultation meetings proposed during operational phase.

*Note: As per JICA guidelines 2010 appendix – 5, ** According Census Data 2011*

4.2 REVIEW OF GUIDELINES AND SUPPORT SYSTEM FOR EIA STUDY:

4.2.1 Environmental Guidelines:

One of the basic premises for this water resources development project is the recognition of sustainable environment as a priority consideration for reinforcing the project objectives. The Environmental Impact Assessment procedure thus dovetails some selected guidelines prescribed by Govt. of India and donor countries.

In the instant case; the EIA study Rengali Irrigation LBC-II Phase-II refers to the following EIA guidelines.

1. **Guidelines for Confirmation of Environmental and Social Consideration' by JICA(2010):**

   The present EIA study confirms to all relevant requirements prescribed in the JICA guidelines 2010 along with meeting the TOR requirements by JICA's expert team (2013).

2. **EIA Guidelines Prescribed by MoEF Notification 2006:**

   Ministry of Environment and Forests, Govt. of India have strengthened Environment (protection) Rule 1986 and modified the guide lines for environmental impact assessment, vide Gazette Notification 14th Sept 2006. The guide lines are further updated with amendments till 2010.

3. **Operational Policies for Environmental Assessment' by World Bank – OP 4.01/1999:**

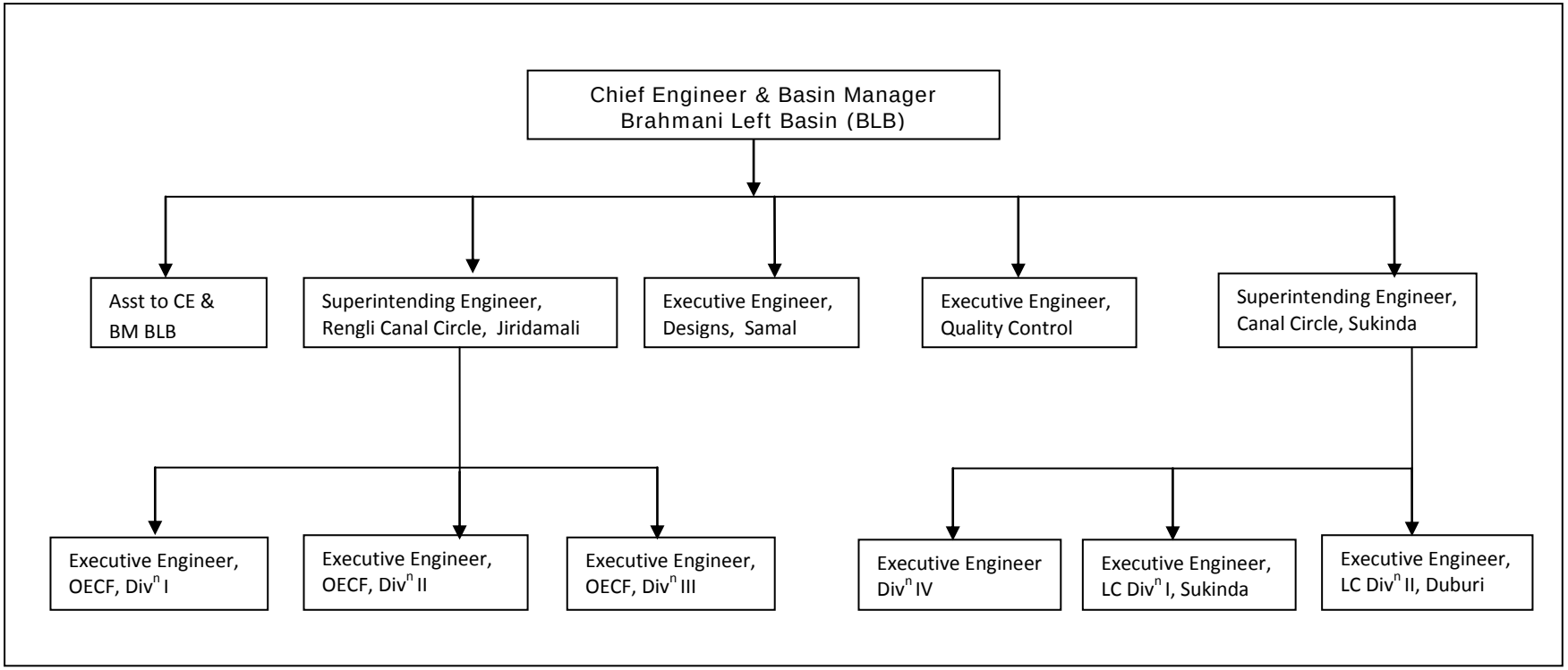
   The World Bank's operational policy OP4.01 prescribes guidelines for Environmental Assessment (EA) in Jan 1999 and is updated in March 2007.

4.2.2 Other Policy, Acts & Legislations of the State & Central Govt. in supporting the EIA Study:

Apart from the Environmental Guidelines stated above, the National and State level policy framework, Legal Acts and Legislation as well as Administrative framework, required to support implementation of environmental management activities have been elaborated in paragraph 1.4 of chapter.1. Various provisions contained therein adequately reinforce the environmental study.

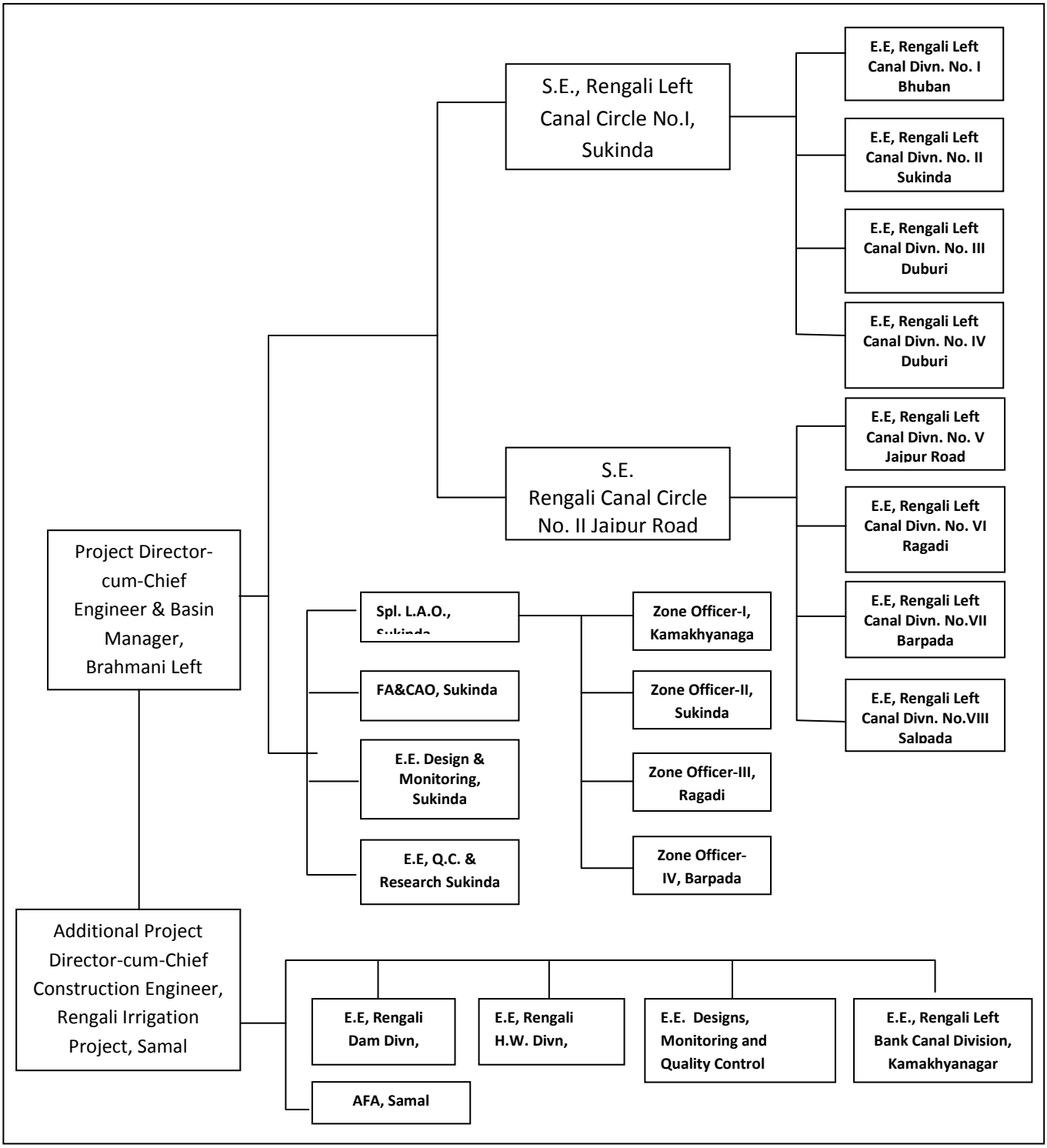
4.2.3 Organizational Support System:

The existing technical organization responsible for implementing the project as well as for maintaining the environmental standards is mentioned below.



***Source**-Project Records*

The proposed organizational structure for implementing the sub project LBC-II Phase-II is shown below.



Source- *Project Records*

However, DoWR/ Govt of Odisha are presently examining the administrative and fiscal feasibility *of the proposed organogram.*

Environmental Scoping Matrix for the Rengali Irrigation Project LBC-II Phase-II

Category	No.	Affected activities / Impact Items	Overall Rating	Planning		Construction Phase						Operation Phase			Reasons of rating	Remarks
				Land acquisition and loss of properties	Changes of land use plan	Deforestation	Alteration to ground by cutting, filling and tunneling	Operation of contractors equipment and vehicles	Construction of canals and other facilities	Traffic restriction in construction area	Influx of workers, Construction of base camp	Appearance/occupancy of canals, other related	Operation of irrigation facilities	Farming based on new irrigation system		
Natural Environment	1	Protected Area (Including Protected and Reserved Forest)	**B**			B	B					B			Protected areas such as national parks, sanctuaries are not be affected. Some protected forests will be affected.	Small Patches of forest
	2	Flora, Fauna and Biodiversity	**B**			B	B					B			No. of trees to be felled Impact expected on floral diversity	Compensatory afforestation plantation proposed
	3	Hydrological Situation	**B**				B		B			B			Construction of new water bodies	
	4	Topography and Geography (including Soil Erosion)	**B**		B							B	B		Canal distribution system appears on land	
	5	Landscape	**B**			B	B					B			Moderate impact due to new construction – canal structure	
	6	Meteorology													There is no activity which causes any meteorological impacts in this irrigation project.	
	7	Global Warming	**C**					C							Minimum effect on global warming- climate change	
	8	Air Pollution	**B**					B							Impact restrict to limited period of construction	
	9	Water Pollution (Bottom	**B**						B				C	C	There is possibility water pollution caused by muddy water	

		Sediment)												of construction and utilizing agrochemicals.	
Pollution control	10	Ground Water Level/Subsidence	**C**				C		C					There is possibility of decrease of GW around Tunnel and deep cut site because of pomp up in construction phase.	
	11	Soil Pollution(Including Salt pollution)	**C**										C	C	There is possibility soil pollution caused by utilizing agrochemicals.	Soil testing proposed periodically
	12	Noise and Vibration	**B**					B	B						Noise and Vibration might be caused by blasting works and using heavy machinery of Tunnel Construction.	Temporary period
	13	Waste	**B**				B				B				Disposal of excavated waste and domestic waste from camps	Localized no serious impact
	14	Offensive Odour	**-**												There is no activity which causes any offensive odour in this irrigation project.	
	15	Disaster	**C**									C	C		It is necessary to confirm the quake and flood resistance of the structures.	
Social Environment	16	Resettlement	**A**	**A**											Displacement will include 204 people (mostly Squatters).	RRP is applicable.
	17	Local economy such as employment and livelihood, etc.	**A**	A											Crop enhancement will improve economic status of people. Project opens up employment opportunity.	Positive impact
	18	Land use and utilization of local resources	**B**		B										Land use will be changed by irrigation project.	
	19	Social institutions and local decision-making institutions	**C**		C										Administration's role in conflict resolution i.e. LA process acquisition of private property.	
	20	Existing social infrastructures and services	**B**				B		B	B		B			Canal system may intercept communication facilities	Roads and bridges proposed
	21	The poor, indigenous and ethnic people, gender and children rights	**B**	B										C	ST and SC lives in affected area.	
	22	Misdistribution of benefits and damage	**C**	C	C		C					C		C	It is necessary to confirm whether misdistribution of benefit and damage will be occurred.	
	23	Cultural heritage	**C**				C					C			It is necessary to confirm the location of cultural heritages in the project sites.	
	24	Local conflict of interests	**C**	C	C		C		C	C		C		C	Disparity of water distribution It is necessary to confirm whether interests distribution is fair.	

25	Water Usage or Water Rights and Rights of Common	**C**											C	It is necessary to confirm whether water rent collection is fair.	
26	Sanitation	**C**										C		There is possibility to change Sanitation of local people by the project.	
27	Hazards (Risk) and Infectious diseases such as HIV/AIDS	**-**												Large scale immigration of laborers is not anticipated as construction activities are mostly mechanized.	
28	Hazards (Risk) and Infectious diseases such as Malaria	**C**						C				C	C	There is possibility to create new swamps by irrigation.	Malaria prevention plan will be introduced.
29	Accident	**B**				B	B	B	B					Risks may arise during construction period	
30	Occupational Safety	**B**					B	B	B						Health plan will be introduced

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impacts are not expected, but survey and analysis shall be done) No Mark: Few impacts are expected. Detailed quantitative survey and analysis is not necessary

Items rated A, B and C should be examined for Environmental Impact Study.

CHAPTER – 5
ENVIRONMENTAL IMPACT ASSESSMENT & MITIGATION MEASURES

5.0 GENERAL:

The primary objective of an impact assessment study is to predict and quantify the magnitude of impacts, asses the importance of likely changes due to the project implementation, evaluate such changes according to their significance and suggest mitigative measures as well as monitoring plans for project components.

In the assessment procedure, Environmental Impacts may be classified as positive & Negative Impacts, Direct or Indirect and Reversible and Irreversible Impacts in regard of all development and operational activities of the project implementation. In the process, the baseline conditions of various parameters and scoping criteria already discussed in chapter–3 and chapter-4 of this document will be the basis of determining potential impacts due to the project.

5.0.1 Approach for Environmental Impact study:

Environmental Impact study emphasizes the following activities.

- Prediction of Impacts.
- Assessment of Negative Impacts.
- Identification of Positive Impacts.
- Evaluation of Impacts to assess the importance of changes likely to occur.
- Formulate plans to mitigate adverse impacts.

5.0.2 Methodology for Prediction of Impacts:

- Prediction is essentially a process to forecast the future environmental conditions of the project area that might be expected to occur because of implementation of the project.
- While every attempt is generally made to forecast future environmental conditions quantitatively, it will be restricted to certain factors as because many social and environmental factors cannot be reliably quantified. So most of the factors are handled qualitatively while quantification is restricted to some feasible environmental issues.
- Impacts of project activities involve projecting the environmental baseline data in to the future scenario.

- Environmental impact is associated with development activities of the project. The components are broadly classified as
    - Land Environment
    - Water Environment
    - Air Environment
    - Noise Environment
    - Biological Environment
    - Socio-economic Environment

5.0.3 EVALUATION OF IMPACTS:

Assessment:

Environmental assessment can be effectively used for inter-comparison of various alternatives. In order to inter-compare alternative plans, two types of information are essential.

1. A summary of positive and negative environmental Impacts.
2. An analysis of the economic implications of the impacts that can be quantified as well as qualitative statements on unquantifiable impacts.

In case; a choice has to be made between "The Project" and "No Project" where in considerable uncertainties exist with respect to the future implication of the either alternatives; the associated benefits, risks and cost need to be carefully analyzed and weighed. The perceptions and value judgment play an important part in the final selection of a specific alternative.

This choice of the 'best' alternative in environmental assessment procedure is primarily based on evaluation of the environmental impact units in quality terms.

This irrigation project LBC-II Phase-II happens to be a continuation of canal construction from RD 71.313 km to 141.00 km with distribution network for 72967 ha command area. It does not involve critical issues like storage, submergence, displacement of population or serious threat to existing ecology. Evaluation of impact as discussed in Chapter-5, can be suitably achieved by "Matrix" method. This matrix method may be considered to be an extension of "Checklist" evaluation procedure.

In this section, attempt has been made to evaluate all positive and negative impacts by using various assessment methodologies as given below.

5.0.3.1 Methodology Adopted For Impact Evaluation:

According to Davis & Muller (1984), various methods mentioned for carrying out evaluation of environmental impacts, seven general categories were suggested by grouping them rationally. They are:

1. Adhoc Method
2. Checklist method
3. Matrix Method
4. Network
5. Overlays
6. Environmental Index
7. Cost Benefit analysis

Each of the above methods is subjective to some extent and none of these are applicable to every case. Methods 1-3 have been considered for impact evaluation of this project because of their advantages described under each method. Methods 4-7 under are not attempted, which are mostly recommended for single projects (Industry, new road projects, transmission lines etc.)

1. Adhoc Method:

Based on the prediction of impacts already described in this chapter, the nature of those impacts is qualitatively grouped; and significance is attached to each. The nature of the impact is qualitatively categorized as follows:

- Positive effect / No effect / Negative effects
- Beneficial / Problematic / Adverse
- Short term / Long Term and
- Reversible / Irreversible

A major advantage of this Adhoc method is that it can be easily applied since it generally consists of statements of data requirements, without outlining the specific impacts on environmental parameters. The method gives a basic idea in determining the 'Alternatives' for the project under consideration.

However, the method also has some disadvantages like,

- No assurance for identification of comprehensive set of all relevant impacts.
- Lack of consistency in analysis.

An Adhoc approach for evaluation of Environmental Impact is given in **Table No. C5-1**.

Table No. C5-1: Adhoc Approach for Impact Evaluation

Sl. No.	Significance of Environmental Impacts / Environmental Areas	No effect	Positive effect	Negative effect	Beneficial	Adverse	Problematic	Short term	Long term	Reversible	Irreversible
1.	Wildlife			X			X	X			X
2.	Endangered Species	X									
3.	Natural Vegetation			X			X			X	
4.	Grading of Construction Areas			X			X		X		X
5.	Soil Characteristics			X			X			X	
6.	Natural Drainage	X									
7.	Surface Water				X		X			X	
8.	Ground Water		X		X						
9.	Air Quality			X				X			
10.	Noise			X				X		X	
11.	Visual Disruption	X						X			
12.	Socio-economic status		X						X		
13.	Health & Safety			X			X		X	X	
14.	Water Logging			X					X	X	
15.	Weed Infestation			X				X		X	
16.	Public facilities (including Health & Education)		X		X		X	X	X		
17.	Public services (Drinking water & sanitation)		X		X		X		X		
18.	Irrigated Agriculture		X		X				X		
19.	Economic values		X		X				X		
20.	Conformity to Regional Plans		X		X				X		
21.	Labour camps			X				X		X	

Source: Guidelines for Sustainable Water Resources Development & Management "WAPCOS" Ltd. 1992.

2. Check List Method:

Check list method is another instrument for effective evaluation of environmental Impacts. There are four broad categories of check lists.

Simple Check list	Provides list of parameters and nature of impacts qualitatively.
Descriptive Check List	Provides guidance on evaluation of various parameters.
Scaling Check list	Similar to Descriptive Check list with additional information on subjective scaling of parameters.
Scaling-weighting Check list	Similar to scaling check list with additional information with subjective evaluation quantitatively.

Of these above categories; Simple Check list method is attempted for evaluation of impacts qualitatively although Scaling-weighting check list devised by **Battelle Columbus Laboratories, (USA)** is most recommended for water Resources Projects, having adverse impacts on Submergence, Ecology & Biodiversity, Wildlife, Environmental Pollution and Human interests etc. In the present check list method relevant environmental parameters are described under various phases of the project implementation, each being evaluated with recommended significance rating.

Table No. C5-2: Check list of Environmental Impact Analysis

SL. NO.	Action Affecting Environment	Significance			
		D1	D2	D3	D4
1.	**Environmental problem due to project location**				
(i)	Resettlement & Rehabilitation	--	--	*	--
(ii)	Encroachment to major ecological factors	*	--	--	--
(iii)	Water-shed erosion/ siltation	*	--	--	--
(iv)	Effect on ground water	*	--	--	--
(v)	Impact on fish species & Fisheries	--	*	--	--
(vi)	Inundation on mineral Resources	*	--	--	--
(vii)	Impact of Land use	--	*	--	--
2.	**Environmental problem due to PROJECT DESIGN**				
(i)	Water Quality for Irrigation	--	*	--	--
(ii)	Water-logging & salinity	---	--	*	--
(iii)	Impact due to Hydraulic structures	*	--	--	--
(iv)	Seismicity	*	--	--	--
(v)	Construction of Tunnel	--	--	*	--
3.	**Environmental problem associated with PROJECT CONSTRUCTION**				
(i)	Soil erosion/siltation	*	--	--	--
(ii)	Pollution due to Construction wastes	--	*	--	--
(iii)	Environmental problem due to labour camps and Health	--	--	*	--
(iv)	Dust, Odour, Fumes and Noise pollution	--	*	--	--
(v)	Water Quality pollution	--	*	--	--
(vi)	Socio-cultural Impacts	*	--	--	--
4.	**Environmental problems related to PROJECT OPERATION**				
(i)	Change in Land use pattern	*	--	--	--
(ii)	Downstream water quality	--	*	--	--
(iii)	Aquatic weeds	--	*	--	--
(iv)	Impacts on soil Fertility	--	--	*	--
(v)	Water logging and Soil salinity	--	--	*	--
(vi)	Improvement in Infrastructure	*	--	--	--
(vii)	Health problem	--	*	--	--
(viii)	Change in settlement patterns	--	*	--	--
(ix)	Industrial growth Impacts	--	*	--	--
(x)	Improvement in Socio-economic level(Positive Impact)	--	--	--	*

Source:-Guide lines for Sustainable water Resources Development & Management WAPCOS-Ltd -1992.

Notation Used:
D1—No significant Impacts
D2—Small Significant Impacts
D3—Moderate Significant Impacts
D4—major Significant Impacts

3. Matrix Method:

Matrix Method may be considered to be an extension to the use of check list. This method originally devised by Food & Agriculture Organization (FAO) of United Nations Organization (UNO) is the simplest tool for evaluation of environmental impacts. In this section attempt has been made to qualitatively evaluate the environmental impacts & to provide some quantitative information for few environmental parameters wherever possible.

4. Analysis Of Environmental Impact With Environmental Matrix:

Matrix method is used to evaluate Impacts both beneficial and detrimental due to implementation of the project. The International commission for sustainable Environment have designed matrix for various activities that may cause impact both positive and negative. This was also incorporated by the Food and Agriculture Organization of United Nations which is a simplistic tool for qualitative evaluation of Impact.

Table No. C5-3: Evaluation of Impacts by Matrix Method

Sl. No.		**Features likely to be affected (Env. Parameter)**							
		Roads and communication	**Colony construction**	**Borrowing of materials**	**Importing of labour**	**Canal construction**	**Soil conservation & landscaping**	**Irrigation**	**Farming Activity**
A.	Forestry & vegetation	+2P	+2P	-	-1T	-1P	+3P	+2P	-1P
B.	Sedimentation & erosion	-1T	-1T	-2T	-1T	-1T	+3P	-1P	-1P
C.	Communication	+3P	+2P	-	-	+2P	-	-	-
D.	Land Area Development.	-2P	+2P	-	-	+2P	+2P	-	-
E.	Agriculture	+2P	+1P	-	-	-	-	+4P	+3P
F.	Food Production	+2P	-	-	-	-	-	+4P	+3P
G.	Public Revenue & Income	+2P	+2P	-	-	+2P	-	+4P	+3P
H.	Water quality	-1T	-1T	-	-2T	-1T	-	-2P	-2P
I.	Air quality	-1T	-	-1T	-	-	+1P	+1P	-
J.	Climate	-1T	-1T	-1T	-	-	+2P	+3P	+2P
K.	Ground water table	-	-	-	-	-	+1P	+1P	-
L.	Employment	+1T	+1T	-	-	+2T	-	+2P	+2P
M.	Health	-	-	-	-1T	-	+2P	-2P	+2P

Notes – Likely effect is symbolized as follows

Notation used : P=Permanent T=Temporary

	Mild	Considerable	High	Very high
Beneficial	+1	+2	+3	+4
Detrimental	-1	-2	-3	-4

Ref: - A guide to environmental Impact Assessment of Irrigation & Drainage projects in developing countries.

FOOD and agriculture organization [FAO] of the United Nation – O.D.A. U.K

Checklist of some environmental issues and action points against evaluated impacts both beneficial and detrimental impacts are suggested below.

Table No. C5-4: Activities proposed under environmental safeguard measures

Sl. No.	Events	Activities	Impacts	Mitigation Measures	Remarks/Action points
1.	Levelling of borrow pits.	For canal construction in banking condition, a lot of earthwork is involved by borrowing earth from borrow pits.	-ve (Temp.)	Proper monitoring and management strategies to be developed to level up all the borrow pits to prevent stagnation of water.	Project In-charge to ensure implementation, through contractual package
2.	To compensate felling of trees during construction	A green belt will be developed by taking up plantation along the canal bank.	-ve (Temp.)	The plantation programme is in progress in due consultation with Forest department. There is funds provision of **Rs. 78.00 lakhs** for taking up plantation work.	Project in-charge. The budgeted provision shall be spent according to the plantation programme provided by DFO.
3.	Restoration of construction areas/ Grading	In the construction areas a lot of excavation and dumping of waste materials will take place.	-ve (Temp.)	Strategies/ policy is to be evolved with contracting agencies to level up areas after completion of work.	Project in-charge to implement through contract agencies
4.	Tree cutting by labourer for fuel wood	Construction labourers in temporary camps may destroy the green cover by felling of trees for fuel purpose.	-ve (Temp.)	Arrangement would be made to provide free fuel by opening fuel depot and supplying fuel to labourers so that unscrupulous felling of trees will be prevented.	Project authority to ensure this through work executions/ contract agencies

Table No. C5-5: Management strategy against some environmental issues

Sl. No.	Events	Activities	Impacts	Environmental management strategy	Remarks/ Action points
1.	Submergence of area	No submergence shall be caused by this project	No	Not required	
2.	Displacement of population due to construction of canal	No population will be displaced due to this canal project	No	Not required	Project authority to contract district Administration for evacuation of squatters.
3.	Land affected due to canal construction	5709 ha of private land will be required for construction of canal.	Moderate Impact (-ve)	Payment of land compensation for private land will be made to the land owners as per, Govt. of Odisha's prevailing rate under Land Acquisition Act.	The Govt. of Odisha has streamlined procedures for payment against acquisition of land. The project authority will ensure this through revenue authority.
4.	Natural Environment Ecology and bio-diversity.	The Canal alignment will involve forest land, felling of trees, disturbance in passage of mega herbivores	Moderate impact (-ve)	Study will be conducted for flora, fauna rare and endangered species.	Conservation plan is under implementation by forest authorities.
5.	Restoration of Free flow in natural drains.	The canal will cross of natural streams, nallahs, rivers on its course. Free flow of these drains likely to be disturbed.	(-ve) Marginal	The project authorities will construct a no. of cross drainage structures to ensure free flow of drains. A sum of **Rs.445.05 Million** has been budgeted in the project cost estimates.	Project authority to ensure this.
6.	Drainage in the Command area	The command area may be exposed to some excess water flow. In adequate field drains may cause water logging in lower pockets.	(-ve) Impact Marginal	Proper distribution of water will be ensured through command area management plan according to CAD&WM programme. WUA will be trained for field management.	Project authority to ensure effective management strategy to be evolved by CADA organization under DoWR. Funds requirement will be according to the programme component.

7.	Spread of malaria and water borne diseases in command area due to introduction of surface water, for irrigation.	The canal water when stagnated may cause breeding of mosquito vectors and may become responsible for spreading of malaria. Domestic water use may cause water borne diseases.	-ve (Moderate)	A conducive Health Services Delivery plan will be implemented by the Health department during Project period. Malaria preventive measures will be scrupulously undertaken. Existing medical facilities will be strengthened.	Project authority will support implementation of Health service Delivery plan by the Director of health Services (DHS)/GoO. Funds requirement will be according to the programme component of DHS.
8.	Increase in use of fertilizer and pesticides	In the proposed irrigated agriculture practice the present consumption of fertilizer and pesticides is likely to go up very high. Excess use of chemical fertilizers and toxic pesticides are detrimental to soil health.	-ve (Marginal)	The farmers will be trained for use of compost, green manure and bio-fertilizers along with chemical fertilizers according to a well-designed fertilizers management plan. Integrated pest management methods shall be adopted.	Forms a part of CAD&WM programme obtainable from Director CADA, DoWR. The project authority in consultation with Districts Agriculture Officer should prepare the fertilizers and pesticides Management plan.
9.	Seepage of canal water and Canal Bank erosion.	Seepage of water is anticipated in banking reaches of Canal. It induces soil erosion, water losses & reduces Canal efficiency. Triggers water logging at the vicinity	-ve (Marginal)	Lining in main canal of LBC is proposed. There is a budgetary provision of Rs. **574.46 Million** in the project cost estimate to carry out lining works.	Project authority
10.	Growth of aquatic weeds.	The growth of aquatic weeds is expected in the main canal, distributaries & minors as well as in some slow moving water bodies. Sluggish flow condition will appear in the canals. Weeds are also responsible for causing habitat of mosquito vectors and other water borne diseases.	-ve (Marginal)	The canal weeds are to be cleared regularly so as to create a conducive flow condition. This can be achieved by combination of mechanical & manual methods. Likely expenditure is budgeted under X-Ecology and Environmental subhead of project cost estimate.	Project authority to monitor weed infestation in canal and command area. Ensure periodic removal of weeds according to a weed Management plan. Entrusting action to SHGs organized by Women. Ensure best uses of weeds for compost

					manure and income oriented activities.
11.	Provision of Canal Bank service road to improve road communication.	The Canal Bank Service Road will be 5.0 m wide and to be black topped, for all weather use. It will link to all existing village roads which are met by the Canal.	+ve Impact	The Canal Bank Service Road for about 70km will improve communication facilities – crop transport and trading facilities. There is a budgetary provision of Rs. **277.35 million** in the project cost estimate for construction of service road.	Project authority
12.	Provision of village road crossings and cattle crossings in the canal length.	Many existing, road linkages, will be intercepted by the canal. Restoration of communication system will be necessary as a tool against Socio-economic development.	+ve Impact	There is a budgetary provision of **Rs. 1906.64 Million** for construction of bridges over NH, S.H. & village Road crossings.	• Project authority
13.	Intensive agriculture	Activities like • Assured water supply for Irrigation • Agricultural Intensification • Command area Management • Farmers training and formation of WUAs etc. will occur.	+ve Impacts	Incremental Value receipt will be Rs **9486.8 Million**. To be utilised largely for the Socio-economic development. Activities will generate employment opportunities.	Project authority will ensure inter departmental association.

Findings:

- It may be seen that negative impacts for this project are minimum / marginal.
- Adequate funds have been budgeted in the cost estimate to implement Management plans & Mitigation measures, against those negative impacts.
- Positive impacts on account of this project are significant.
- Increase in food production, communication improvement in rural areas and creation of agro based employment opportunities are notable positive outcomes which will uplift the Socio-economic status of people.

5.0.4 Impacts Assessment Methodology:

Assessment of Impacts on various environmental issues mentioned above in the paragraph encompasses study of impacts at various phases of project cycle, namely:

I. Impact due to Project location

II. Impact due to Project Design

III. Impact due to Project construction

IV. Impact due to Project operation

5.1 NEGATIVE ENVIRONMENTAL IMPACTS:

This section focuses identification / appraisal of Negative Impacts likely to result from the project implementation during its four phases of project cycle.

5.1.1 Impact due to project location:

In this project cycle; study included those impacts which are likely to take place due to the layout of the project and some other locational changes. These impacts were sorted out as follows.

I. Impact due to change of land use.

II. Impact due to loss of forest land / Impacts on Ecology and Bio – diversity (Flora, Fauna and wild life habitats etc.).

III. Impact on drainage of the study area.

IV. Impact on Historical and Archaeological monuments.

V. Impact on existing communication & transport Facility.

VI. Impact on Affected villages / properties & population.

5.1.1.1 Change of Land use:

Development of Rengali Irrigation Project under Left Bank Canal LBC-II Phase-II is a continuation of canal system commencing from its completed Phase-I i.e.

which ended at RD 71.313 km. Most part of the land requirement for this subproject comprises of land for construction of Main Canal from RD 71.313 km. to 141.00 km and for its wide distribution network to cater irrigation to 72967 ha of CCA.

According to the baseline assessment, the present area under cultivation includes existing agricultural land practiced with Khariff cultivation during June to October (Monsoon months). The significant change in land use after the project operation phase will be conversion of 72967 ha of shown area to all time greenery of farm land agriculture almost throughout the year.

The total land requirement for the subproject is thus categorized as permanent land requirement and temporary land requirement.

Table No. C5-6: Category Wise Permanent land requirement

SL. No.	Use based Particulars	Requirement of land with and Category			
		Forest land (ha)	Private Land (ha)	Govt. land (ha)	Total (ha)
1	Construction of Canal				
	• Main Canal / LBC–II Phase-II (RD 71.313km to 141.00Km)	278.950	529.350	200.98	1009.280
	• Branch Canal & Distributary	296.514	495.980	201.60	994.094
	• Minors & Sub Minors	197.676	994.050	302.40	1494.126
	Subtotal Item – 1 Canals	**773.140**	**2019.380**	**704.98**	**3497.500**
2	Construction of Staff Colony				
	• For Existing staff colony (Additional Land)	-------	-------	0.80	0.80
	• For proposed staff colony [@ 1ha x 4Nos]	--------	--------	4.00	4.00
	• R & R Colony [Not Contemplated]	--------	--------	--------	Nil
	Total Item – 2 Colony	**--------**	**--------**	**4.80**	**4.80**
3	Compensatory Afforestation			2141.00	2141.00
Total land for permanent use		**773.140**	**2019.380**	**2850.78**	**5643.30**

Source: Project Authorities

Table No. C5-7: Requirement of Land for temporary Use

Sl.	Use based	Land requirement

No.	Particulars	Forest land (ha)	Private Land (ha)	Govt. land (ha)	Total (ha)
1	Land for construction of quarry Roads	Nil		4.90	4.90
2	Land for construction of Approach Roads to construction sites	Nil	10.00	10.16	20.16
3*	Land for construction of temporary labour camps	Nil	Nil	36.00	36.00
Total land for temporary use (1+2+3)		**Nil**	**10.00**	**51.06**	**61.06**

Source: Project Authorities

*Note: There will be 36 packages to operate at various locations, Govt. land @ 1.00 ha for each packages / per camp has been estimated.

Status of Land Acquisition:

Forest land: Diversion proposal for 1295ha of forest land has been submitted and stage-II F.C. is being actively undertaken by Forest Authorities.

Private Land: Land Acquisition proposal for 2019.38 ha of Private land has been submitted to the District Revenue Authorities. The Abstract of such list is furnished in **Chapter–2 / Table C2-13**.

Govt. Land: To be alienated.

Impact Analysis:

- Out of the total land requirement for permanent land use, the forest land constitutes 13.70% for which approval for diversion of forest land will be obtained from the competent authority (MoEF/GoI). Appropriate Non–Forest Revenue land will be diverted to the Forest Department for compensatory afforestation.

- The acquisition of private land constitutes 35.78% of the total land requirement. The extent of this private land is widely spread in three districts so that the Impact is reduced to minimum. Land compensation will be paid to the land owners at the prevailing land rate prescribed by the

State Government according to the State LA Act and R&R Policy 2006 read with amendments.

However compensation package for the above private land owners is discussed in Chapter -7 of this document.

- There are six numbers of permanent staff colonies already existing at locations like Sukinda, Duburi, Bhuban, Badjhare, Kamakhya Nagar and Jiridamali. Additional Govt. land for 0.80 ha is requested for extension of Executive Engineer's office.

  Apart from the above, there is proposal for four new staff colonies at Mangalpur (Jajpur), Jajpur Road (Jajpur), Ragadi (Jajpur) and Salapada (Keonjhar) according to the restructured organogram proposed for implementation of this Phase-II works the land requirement is estimated @ 1.00 ha/colony.

- Land required for temporary purpose relates to use of land during the construction period (presumed as 5 years).

  Land for establishing temporary labour camps will be selected from Govt. land available in the vicinity of works. Care should be taken to locate these camps away from the existing village locality to avoid social conflict.

5.1.1.2 Impact on Forest and Biodiversity:

A. Impact on Forest (Flora and Fauna)

A1. Birasal Forest in LBC–II Phase–II:

At RD- 71, the Birasal R.F., which is the home range of elephant, has been intersected by this canal. This R.F is in Kamkshyanagar Range of Dhenkanal Forest Division. This RF comprises an area of 1362.9 ha, which has been mostly allocated to eco-restoration Working Circle of Ranjagad treatment Series. By referring the Working Plan of Dhenkanal Division valid up to 2013-14, it is seen that the crops of Birasal R.F. has been badly degraded due to heavy biotic interference. This forest area comes under mixed deciduous forest and according to Champion and Seth's Classification it comes under $3C/C_3$. There is no distinct history of trees in this forest. The common species noticed are Sal, Asana (*Terminalia alata*), Mahul (*Madhuca indica*), Bija (*Pterocarpus marsupim*), Dhaura (*Anogeissus latifolia*), Salai (*Boswellia serrata*), Siali (*Bauhnia purpurea*) , Dhatki (*Woodfordia fruticosa*), Girli (*Indigofera cassioides)*, Gangasioli (*Nyctanthus arbor-tristis*), Pani Gambhar (*Trewia nudiflora*), Date Palm *(Phoenix aqualis)*, Siali (*Bauhnia valii*), Palas (*Butea monosperma*), Kurei (*Hollarhena anti-descenterica*).

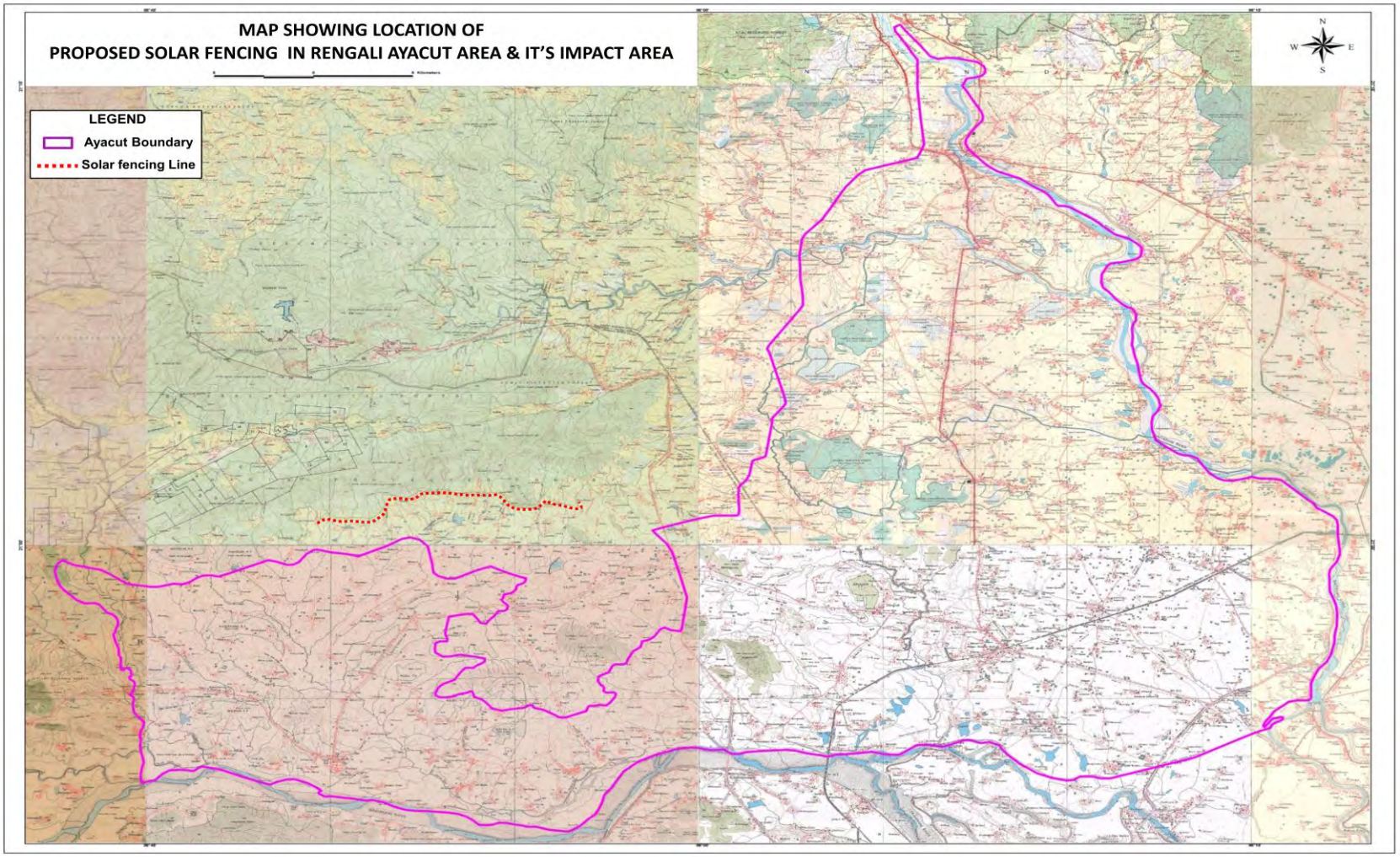


Fig.No.C5-1: Map showing proposed solar fencing

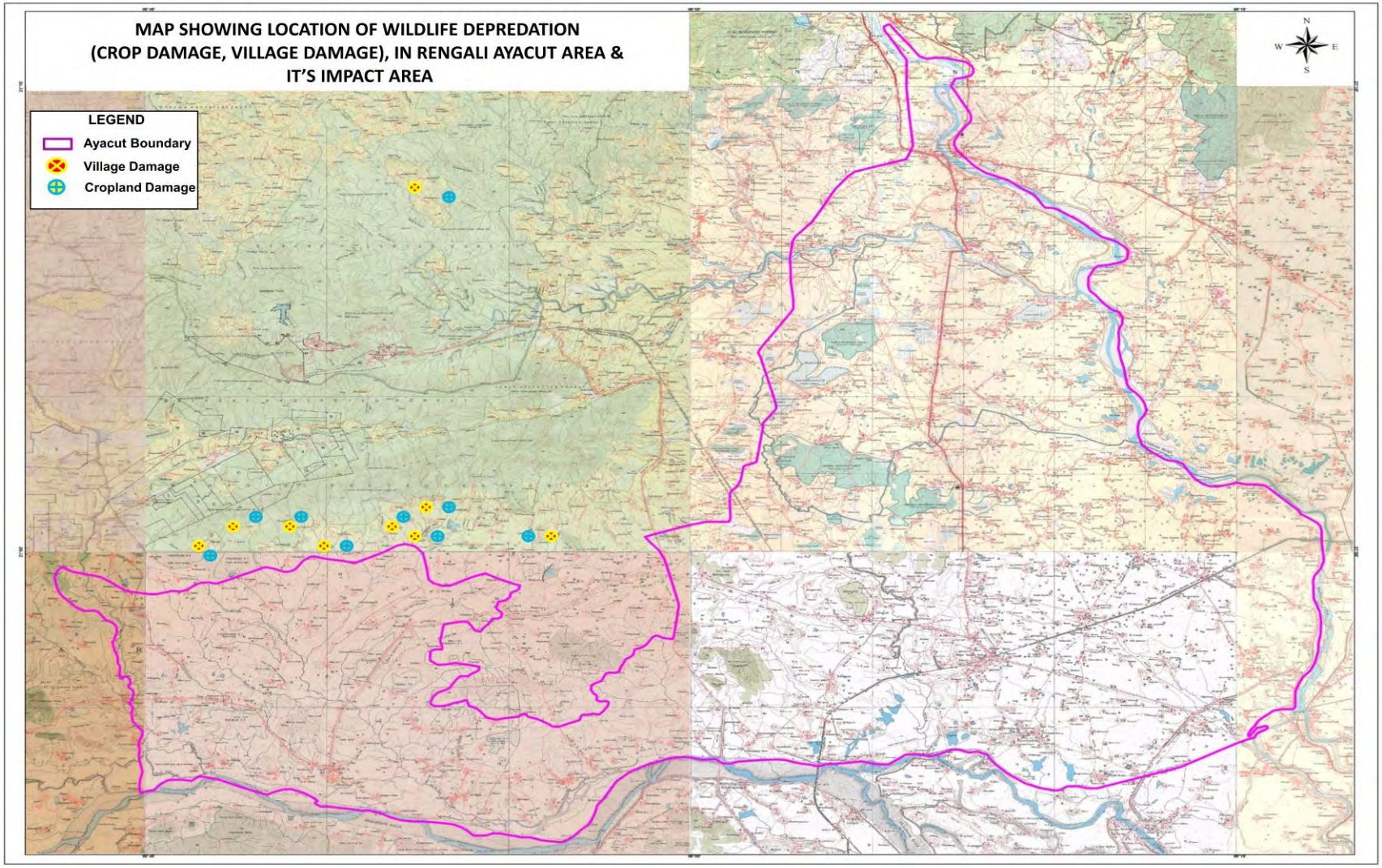


Fig.No.C5-2: Map showing locations of wild life depredation during November 2013

The Working Plan prescription envisage:-

1. To improve the conditions of existing forests through protection against grazing, fires and illicit felling.
2. To enhance soil productivity through soil and moisture conservation measures.
3. To stabilize the ratio between water run-off during rainy season and that of during dry season.
4. To restock barren areas through artificial regeneration of most desirable indigenous species.
5. To involve the local community in protection and management of the forests.
6. To restore and improve the microclimate and microedaphic condition.
7. To increase the biodiversity and heterogeneity in the forest crop by encouraging natural regeneration.

We also suggest the improvement of this habitat at left bank of the LBC by protection and artificial regeneration

A2. Mahagiri Forest in LBC–II Phase–II:

The next compact forest area in left embankment is. Mahagiri DPF of Sukinda Range of Cuttack Division. The total forest area is 6719.45 ha and a major portion has been allocated to Rehabilitation Working Circle. The Working Plan of the Division (valid up to 2016-17) gives an impression that Mahagiri DPF is mostly open mixed miscellaneous forest in various stages of degradation. The portion of the canal that will pass through the foot hill of this DPF contains shrubs to the tune of 27 % extent of open forest over 37 % (Canopy Density: 0.1 to 0.25). This forest has been classified as Northern Tropical Dry Deciduous Forest Type ($5B/C_2$). The common species found in this forest such as Sal (*Shorea robusta*), Dhaura (*Anogesissus latifolia*), Karda (*Cleistanthus collinus*), Asan (*Terminalia alata*), Char (*Buchanania lanzan*), Kendu *Diospyrus melanoxylon*), Sidha *(Lagerstroemia parviflora*) etc.

The special objective of management as prescribed in the Working Plan is as follows:

1. To induce natural regeneration and improve the condition of existing forests through protection against grazing, fires and illicit felling.
2. To enhance soil productivity through soil and moisture conservation measures.]
3. To regulate surface water run-off to enhance percolation and water availability down the stream.

4. To restock barren areas through artificial regeneration of most desirable indigenous species.
5. To partner the local community in protection and management of the forests.
6. To restore and improve the microclimate and micro-edaphic condition.
7. To increase the biodiversity and heterogeneity in the forest crop by encouraging natural regeneration.
8. To increase the water retaining capacity of the soil.
9. To protect and conserve the floral and faunal diversity of the forest.

It is also suggested to improve this habitat at left bank of the LBC by protection and artificial regeneration.

The remedial measures are deployment of anti-depredation squad in and around the villages existing on both sides of LBC & RBC.

As per Wildlife Protection Act, 1972 Sloth Bear has been declared as threatened species (**Schedule-I**). But in Odisha no mechanism has yet been developed for Wild Bear Census. So far Census of Tiger, Crocodile, Leopard, Elephant and Birds have being conducted by the wildlife dept. of the State Govt.

In Odisha no Census of Jackal has yet been conducted. When LBC & RBC are complete the embankment will be full of grasses, bushes, shrubs and herbs so the rodents, hare etc will come for grazing to which Jackal can easily prey. Jackals prefer to make the bore hole below the trees having buttress. Particularly ***Bombax ceiba*** has got a morphological character of buttressing. Therefore, when selecting species for plantation particularly Compensatory Afforestation, ***Bombax ceiba*** should be planted at a spacing of 10 m x 10 m.

Development of adequate forest cover is the essence to provide shelter and protection to Sloth Bear/ Jackal. Therefore, while felling trees for progress of canal care should be taken to minimize the number and leave dead, drying and diseased trees which will serve as furniture for Bear as it has tendency to shorten its claws in trees. While felling trees the lups and tuffs should be allowed to remain in the side which will be base for growth of termites mound and ultimately Sloth Bear get their food.

The habitat destruction has been caused due to illicit felling caused by adjoining villagers to mitigate their fuel wood and small timber need. The species felled are mainly Sal (*Shorea robusta*) and associates but non Sal species are planted during compensatory afforestation by State Forest Department which affects the Biodiversity. Experts would suggest that during proposed Canal Bank Plantation, the Elephant Qualifier Species should be given preference, list of which has been furnished separately. Experts also conducted a village meeting in Raibol Village on 31.10.2013. The villagers expressed that, almost every year this village is being affected by elephant menance and causes damage to crop, house and human life. Even two days prior to our 2nd visit to the Project site i.e. on 9th to 11th November 2013, a herd of 20-25 elephants raided crop fields of Birasal village continuously for 3 days and damaged paddy. However, the villagers in group using firecrackers could drive the elephants to the nearby Mahulabhanja RF, which has been proved to be one elephant habitat in Forest records of Odisha.



Consultants, by interaction with the villagers in their earlier visit came to know that they are not aware of the procedure and requirement of documents to be provided to local forest officers for claiming compassionate relief for crop damage. However, since our team educated them, the affected villagers have reported the incidence of crop damage by elephants to Range Officer, Kamakshyanagar on 12.11.2013 and promptly the Forester, Birasal visited the Village and took account of the crop damage.

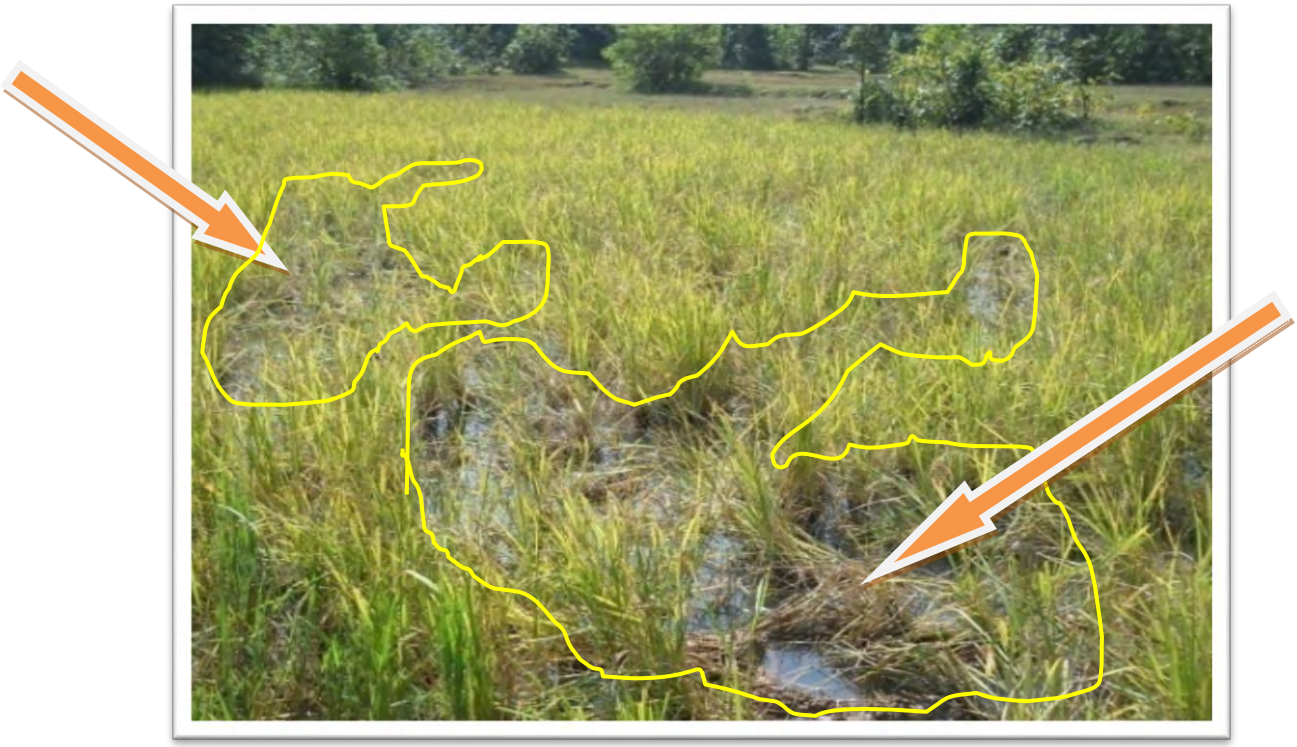
During winter, Bear depredate to nearby villages for consuming pumpkins raised by villagers in their kitchen yard and sugar cane for their commercial purpose. During later part of winter the Bear come out of their den for consuming Mahua (***Madhuca indica***) flower, when Man-Animal Conflict takes place.

During discussion with villagers it was understood that a good pack of Jackal live in Birasal RF (in Dhenkanal Division) and Mahagiri RF (in Cuttack Division). During summer when the deciduous forest become leafless and the Jackal find difficult for hunting, practice to visit the nearby villages and predate on chicken, calf, kitten etc

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VILLAGE MEETING HELD AT KANKADAPAL VILLAGE ON 7TH NOVEMBER 2013



CROP DAMAGED BY ELEPHANT DURING DECEMBER 2013



CROP DAMAGED BY ELEPHANT SHOWN BY LOCAL INHABITANT

The villagers are of the opinion that if solar fencing is provided to crop field seasonally for five months i.e. October to February and then removed after harvesting season, the regular damage by elephant can be diminished. The villagers agreed to keep the solar fencing in their custody for further use. Our team also conducted village meeting in Bamnagar on 7th November-2013, where it was evident that the elephant from Mahagiri DPF are coming down and causing crop damage/ house damage every year. The villagers proposed a solar fencing around the foot hill of Mahagiri DPF for five months in a year. It is evident that elephants in good number are visiting in Birasal R.F., Baghabasa R.F. and Mahagiri DPF and during harvest period elephants are coming to crop field for raiding.

A3. Proposed Remedial Measures:

Our team has also visited the proposed canal alignment from RD -71.313 to 104km of Phase-II. In this stretch excavation of canal is in progress. On field study it is seen that at RD-71, near Birasal RF in Dhenkanal Division the forest has been intersected in to two halves by the canal. The major portion of this stretch of LBC from RD 71.313 km to RD 104.00 km has been aligned on the foot hill of Mahagiri P.F, which is located on the left embankment of the LBC. This Mahagiri PF is one acknowledged habitat of elephant. Thereafter, on the Right

although a number of RFs are existing but only Dhalpur, Brabati, Baran, Meghnad Pahi and Patilo are to be taken care of. However, beyond RD-104 up to RD-141 the canal is not affecting any forest area nor viable elephant habitat exists and this portion of the canal mostly exists in the Keonjhar Wildlife Forest Division. In this portion there is no report of elephant human conflict nor any elephant presence reported in forest department census report. It is to mention here that since the left embankment of the canal is having forest area where elephant often visit and tend to cross the canal to negotiate right embankment which is the proposed Aycat of this project. It is suggested that, the forest in the left embankment should be enriched by improving habitat by providing watch and ward throughout the year and solar fencing to restrict elephant movement to right embankment. This will restrict elephant interference in the Aycat area. Irrigation Engineers have proposed a number of roads over bridges for use by villagers and light vehicles. In course of time it is likely that some of these cross-overs may be used by elephants also. Therefore, it is suggested that number of such road over bridges should be limited and provided with solar powered gates to be operated manually for which three persons (8 hourly) are to be deployed throughout the year, who may close the gate when noticing approach of the elephant at any time of the year particularly during harvest season. However, it is proposed that only two ramps of 6 m width on either side of the canal may be provided with adequate slope for the elephant movement, one near Birasal RF and the other near Garamian Village (exact location need further field verification). The project authority will not encourage cultivation of 'Cannabis' tobacco or such other crops other than the cropping pattern recommended by the DAO.

A4. Analytical Approach:

The list of flora and fauna noticed in Birasal R.F. and Mahagiri DPF have been furnished in details above. From the adverse impacts of damage caused to the forests like Birasal in Dhenkanal Division and Mahagiri DPF in Cuttack Division is the primary reason for elephant depredation in Aycut Area of the existing canal system. The whole intension of extension of the canal is to enrich the crop production in proposed Aycut area on the right of the LBC. But unless biotic interference like illicit felling, grazing of cattle and fire hazard in these forests are rightly attended; the elephant, who profusely browse forage and consume water will instead of staying in their natural habitat may come to Aycut area and there by the whole intension of extending the canal may not be fulfilled to the extent desired. So we suggest the following remedial measures:

1. Adequate protection to the forest by deploying, local un-employed youth throughout the year, at least for coming ten years.
2. To increase the capacity building of the local VSS not only to protect the forest of their limit but also to assist the villagers who are suffering from elephant depredation for getting due compensation from State Forest Department.
3. To increase adequate Soil Moisture Conservation in Birasal RF and Mohagiri DPF by applying soil conservation measures.
4. To improve the microclimate and micro-edaphic conditions.
5. To increase the biodiversity by encouraging the natural regeneration of principal species.
6. To regulate surface water run-off to enhance percolation and water availability down the stream.
7. To create adequate number of Water Harvesting Structures inside forest area from where the elephant can quench their thirst, bath and puddle.
8. To restore the barren areas through plantation of indigenous species.
9. To manage the Forest in JFM mode.

So far as Conservation is taken in to consideration, the wisest way is to identify the Keystone or Umbrella Species and their habitat. So that the Conservationist can easily conserve and ultimately other Species will be conserved. According to Status and importance of the species the Elephant is the Keystone as well as Umbrella Species. So it is necessary and wise to conserve Elephant, so in this report Experts have been prepared the plan basing upon the conservation measure and to improve the habitat status of the Elephant.

NB: There is always a misconception about elephant habitat / corridor/ passage:-

Elephant habitat: A large forest landscape used by a major portion of population of the region for longer period of stay, which provide food, water shelter and an environment for successful breeding.

Elephant Corridor: Strips or patches of forests that link two viable habitats, and mainly used by elephants for migration from one habitat to another.

Elephant Passage: These are just cross over.

Yet Govt. of Odisha in Wildlife wing have identified 14 corridors as furnished below.

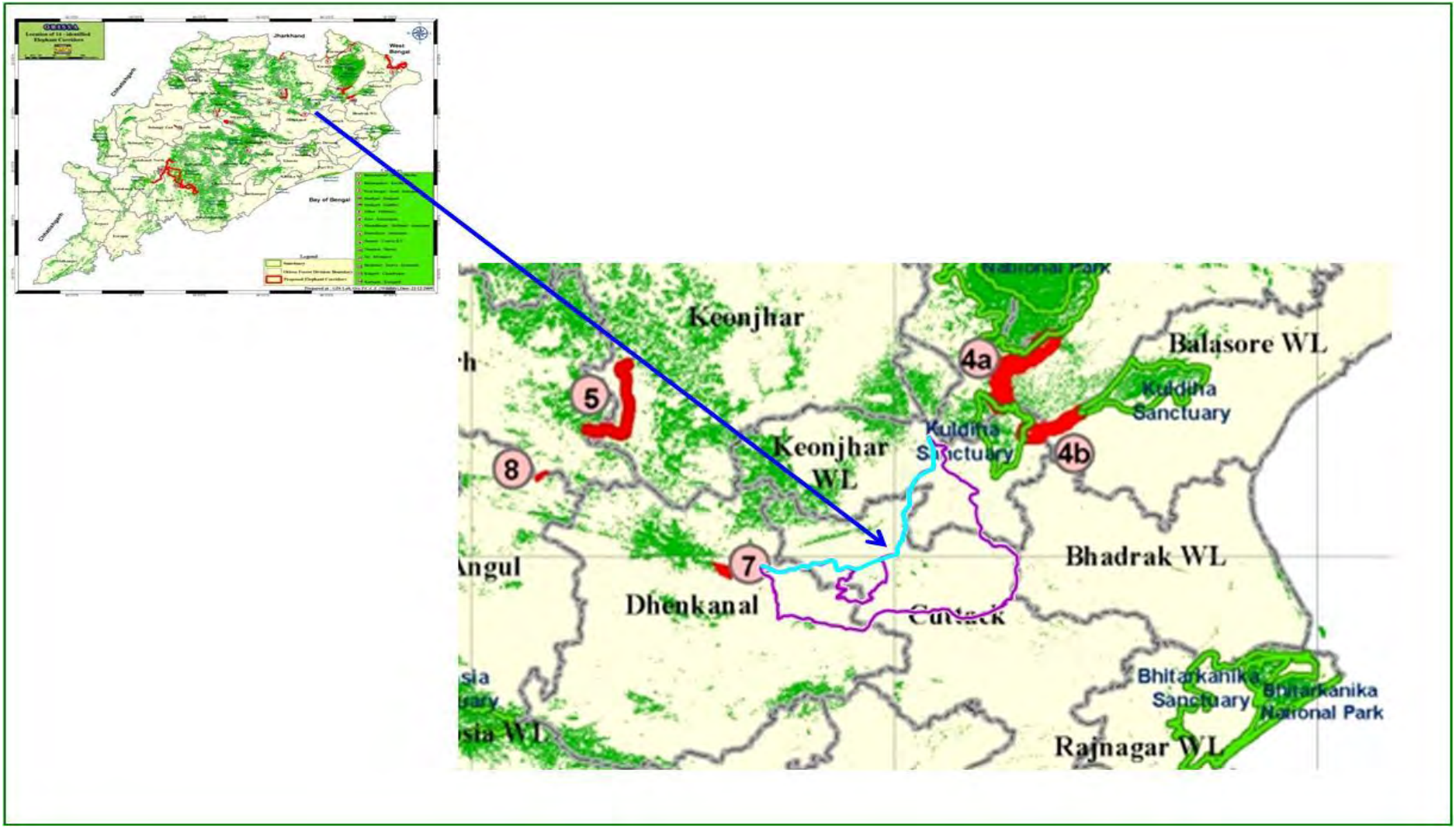


Fig.No.C5-3: Map showing Elephant corridors of Odisha around the project area

Elephant Corridors:

14 corridors identified in the State till date

Corridor Management Plan under preparation

- Total Length of corridors: 420.8km
- Width range: 0.08-4.6km
- Total Area of 14 corridors: 870.61sq.km

1. Badampahar - DhobaDhobin
2. Badampahar-Karida
3. West Bengal-Deuli-Suliapada

4a,b. Similipal-Hadgarh-Kuldiha

5. Telkoi-Pallahada
6. Karo(Keonjhar)-Karampada (Jh.khand)
7. Maulabhanja-Jiridimal-Anantpur
8. Kahneijena-Anantpur
9. Buguda-Central RF of Nayagarh Divn
10. Nuagaon-Baruni
11. Tal-Kholgarh
12. Barpahad-Tarava-Kantamal
13. Kotagarh-Chandrapur
14. Karlapat-Urladani

Presently in the Project area elephants of Anantapur habitat have come to Maulabhanj habitat crossing Jiridamali and causing crop raiding in the right Aycut of LBC Rengali.

B. Impact due to Loss of trees

B1. Loss of trees along canal alignment:

Table No C5-8: Trees enumerated in the Canal alignment

Name of Village	**No. of Trees**
Baragaji	01
Kaduabandhi	09
Rankia	02
Kantapal	29
Bandhagaon	35
Dudhajodi	01
Kesharpar	106
Murdanga	194
Total No. of Trees	**377**
Canal from 94.50 km to 141 Km	67
Sansailo	13
Dhamanagadia	99
Nadiabhanga	121
Sulia	31
Ragada	25

Salijanga	136
Talagaon	07
Biragovindpur	44
Total No. of Trees	**543**
Korei Branch Canal	00
Kantabania Distributary	00
Mukundpur Distributary	00
Radhanagar Distributary	00
Kurupada Sub Distributary	00
Barapada Br. Canal	00
Danagadi Distributary	00
Minors off taking from LBC	00
Grand Total	**920**

B2. Mitigation Measures (Plantation)

i. Canal Bank Plantation to be done in Phase-II:

The total length of Canal in Phase II is from 71.313 km to 141 km i.e. about **70 km**. Out of this approximately 3.0 km will be affected by tunnel, where no plantation should be raised rather allowed to remain as such for safe elephant passage. Besides, approximately 3.0 km will be used for aqueducts, bridges, over pass and other structures. In addition 2.0 km may not be used for any plantation considering the soil quality. Therefore, 71.0 km – (3.0 km + 3.0 km + 2.0 km) = **63.0 km can be used for Canal Bank Plantation**. Out of this with an approximate estimation **30.0 km Canal Bank Plantation can be raised in filling areas and 33.0 km in cutting sides.**

In filling side borrowed soil will be used for heaping in the embankment. This will provide good fertility gradient for the plants to grow. In such area basing on the soil profile 2 rows of plants at a spacing of 5 m from plant to plant and 1.5 m from row to row will be applied. The alternate rows to be arranged in staggered manner. Therefore, per RKM the plant population will be 1,000 m /5m x 2 rows=400 plants.

30.0 km x 400 plants in two rows x at both country sides of the embankment = 24,000 plants will be planted.

The cost for per plant is Rs. 362/- with 04 years maintenance as approved by the Forest Dept. x 24,000 plants= **Rs.0.86 crores**.

Species suitable for plantation should have following qualities. It should be less deciduous period in a year, should bear colourful flowers, should have fruits suitable to be consumed by wildlife, the canopy should be dome shape to provide shade to passers-by, should have soil retaining capacity and either moist loving or xerophytic in nature. The species suitable for Canal Bank plantation are Simuli (*Bombax ceiba*), Silver oak (*Grevillea robusta*), Palas (*Butea monosperma*) , Bara (*Ficus benghalensis*), Sissoo (*Dalbergia sissoo*), Tentra (*Albizzia procera*), Borada (*Bauhinia purpurea*), Chhatian (*Alstonia scholaris*), Tentuli (*Tamarindus indica*), Neem (*Azadirachta indica*), Patuli (*Lagerstroemia speciosa*), Jack fruit (*Artocarpus heterophyllus*) and Kadamba (*Neolamarckia cadamba*).

Similarly from cutting area 33.0 km will be planted with 26,400 plant @ Rs. 362/- = **Rs. 0.95 crores.** Thus in total for Canal Bank Plantation the cost will be ***Rs.01.81 crores*** **to be spent by Forest Dept. in four years. The annual flow chart is also furnished herewith**.

Attention will be given to moist loving plants in the 2nd row of Canal Blank Plantation, where leaching of water from canal is expected. These species are Asan (*Terminali alata*), Arjuna (*Terminali arjuna*), Jamun (*Syzygium cumini*), Pani Gambhar (*Trewia nudiflora*), Ambada (*Spondias mangifera*), Mango (*Mangifera indica*), Ashok (*Saraca asoka*), Champa (*Michelia champaka*), Kadamba (*Neolamarckia cadamba) etc.*

Cost Norm for Canal Bank Plantation (250 plants per RKM, wage rate Rs.150 per man day) Spacing plant to plant 4 m.

(1)Preparation of Nurseries

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Cost of 8(eight) months old seedling with cost of transportation to site of planting (cost of 250 potted seedlings and 10% casualty replacement)	14	2100	400	2500

(2) 0th Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Survey, demarcation, site preparation, alignment &	4.5	675	25	700

	stacking				
(ii)	Digging of pits (45 cm X 45 cm X 45 cm)	21	3150	0	3150
(iii)	CDM (125 cft. @ 0.5 cft per pit)			2000	
(iv)	Contingency			125	
	Total	**25.5**	**3825**	**2150**	**5975**

(3) 1st Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Distribution of inputs in pits	1	150		150
(ii)	Planting of seedling with short carriages including CR & application of basal dose 50 gm & pesticides 5 gms per pit	5	750		750
(iii)	Complete weeding	7.5	1125		1125
(iv)	Intensive soil working 15 cm deep 7 45 cm radius around the plant with application of 2nd dose of fertilizer 50 gm per plant	5	750		750
(v)	Provision of soil & water conservation measures by providing circular trench in flat land & half moon trench in floor area	2.5	375		375
(vi)	Cost of fertilizer NPK/DAP & pesticide		0	500	500
(vii)	2nd weeding	5	750		750
(viii)	Watering 1st Dec to 31st March	50	7500	100	7600
(ix)	Watch and ward per RKM	60	9000		9000
(x)	Contingency			100	100
	Total	**136**	**20400**	**700**	**21100**

(4) 2nd Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	10% casualty replacement including cost of seedling 40 no.s	2.5	375	325	700
(ii)	Weeding, soil working and application of fertilizer (50	15	2250	200	2450

	gm/plant)				
(iii)	Watering 1st April to 15th June & 1st Dec to 31st March	100	15000	200	15200
(iv)	Watch & ward per RKM	91	13650		13650
(v)	Contingency			100	100
	Total	208.5	31275	825	32100

(5) 3rd Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Maintenance of plants including shrub cutting, weeding & soil working	10	1500		1500
(ii)	Watch & ward per RKM	91	13650		13650
	Total	101	15150		15150

(6) 4th Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Maintenance of plants including shrub cutting, weeding	0	0		0
(ii)	Watch & ward per RKM	91	13650		13650
	Total	91	13650		13650

Abstract

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
1	Cost of nursery	14	2100	400	2500
2	0th Year (except nursery)	25.5	3825	2150	5975
3	1st Year (except nursery)	136	20400	700	21100
4	2nd Year	208.5	31275	825	32100
5	3rd Year	101	15150	0	15150
6	4th Year	91	13650	0	13650
	Total	**576**	**86400**	**4075**	**90475**

Rs.90,475/- / 250 plants = Rs.361.90 or Rs.362/- per plant.

ii. Avenue Plantation to be done in Phase-II:

As a matter of pragmatism, now Govt. of Odisha is connecting all weather roads to all villages in the PMGSY Scheme. In such an event it is hopeful that roads from the canal to following villages over a length as mentioned against each will

be constructed. Therefore, it will be useful to provide avenue plantation on both side of such roads which will be helpful in giving shade to passersby and from aesthetic point of view. Total length of avenue plantation is 9.0 km. In such village roads single row plantation with *Bamboo gabions* will be provided.

Sl. No.	**Name of Villages**	**Distance from Canal Bank (in km) of Phase II**
1	Anala	0.30
2	Bhalukipatia	0.44
3	Garamian	0.65
4	Nuadihi	0.39
5	Baulapal	0.49
6	Madhuban	0.87
7	Birigorha	0.95
8	Nadibhanga	0.63
9	Gorhigotha	1.02
10	Sentaragarhia	0.37
11	Deogaon	0.52
12	Nuapara	0.32
13	Balarampur	0.44
14	Chaumuhin	0.68
15	Kasnipura	0.28
16	Indupur	0.56
17	Kolaagadia	0.35
	Total	**8.96 (9.0)**

The cost of single row avenue plantation with 4 years maintenance with bamboo gabion will cost Rs.712/-. The avenue plants will be planted on both side of the above roads at a distance of 4 m. Thus in 9.0 K.M or 18 RKM the plant population will be 09.0 K.M. x 250 = 2,250 plants. The species to be planted on Avenue should have the characteristic of semi-ever green, flowering, fruit bearing, quick growing, parts of the plants can be used for mythological purpose/ medicinal purpose. Considering these, the species to be planted on avenue plantation are :- Kadamba (*Neolamarckia cadamba*), Champa (*Michelia champaka*), Mango (*Mangifera indica*), Bel (*Aegle marmelos*), Neem (*Azadirachta indica*), Karanj (*Pongamia glabra*), Asan (*Terminalia alata*), Radha chuda (*Peltoferrum ferrugenium*), Sunari (*Cassia fistula*), Patuli (*Lagerastroemia flos-regine*), Nageswar (*Messua ferrea*), Mysore queen (*Spathodia campanulata*), Muchkunda (*Pterospermum acerifolium*) etc.

The estimate is furnished below:-

The total cost of Avenue Plantation will be Rs.712/- per plant x 500 plants x 9 km = **Rs.0.32 Crores.** The annual follow chart is furnished below.

Cost Norm for Avenue Plantation (250 plants per RKM, wage rate Rs.150 per man day) Spacing- plant to plant 4 m.

(1)Preparation of Nurserys

Sl. No.	Item of Work	Mand ays	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Cost of 8(eight) months old seedling with cost of transportation to site of planting (cost of 250 potted seedlings and 10% casualty replacement)	14	2100	400	2500

(2) 0th Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Survey, demarcation, site preparation, alignment & stacking	4.5	675	25	700
(ii)	Digging of pits (45 cm X 45 cm X 45 cm)	21	3150	0	3150
(iii)	CDM (125 cft. @ 0.5 cft per pit)			2000	
(iv)	Contingency			125	
	Total	**25.5**	**3825**	**2150**	**5975**

(3) 1st Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Distribution of inputs in pits	1	150		150
(ii)	Planting of seedling with short carriages including CR & application of basal dose 50 gm & pesticides 5 gms per pit	5	750		750
(iii)	Complete weeding	7.5	1125		1125
(iv)	Intensive soil working 15 cm deep 7 45 cm radius around the plant with application of 2nd dose of fertilizer 50 gm per plant	5	750		750
(v)	Provision of soil & water conservation measures by providing circular trench in flat land & half moon trench in floor area	2.5	375		375

(vi)	Cost of fertilizer NPK/DAP & pesticide		0	500	500
(vii)	2nd weeding	5	750		750
(viii)	Watering 1st Dec to 31st March	50	7500	100	7600
(ix)	Watch and ward per RKM	60	9000		9000
(x)	Contingency			100	100
	Total	**136**	**20400**	**700**	**21100**

(4) 2nd Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	10% casualty replacement including cost of seedling 40 no.s	2.5	375	325	700
(ii)	Weeding, soil working and application of fertilizer (50 gm/plant)	15	2250	200	2450
(iii)	Watering 1st April to 15th June & 1st Dec to 31st March	100	15000	200	15200
(iv)	Watch & ward per RKM	91	13650		13650
(v)	Contingency			100	100
	Total	208.5	31275	825	32100

(5) 3rd Year

Sl. No.	Item of Work	Mand ays	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Maintenance of plants including shrub cutting, weeding & soil working	10	1500		1500
(ii)	Watch & ward per RKM	91	13650		13650
	Total	101	15150		15150

(6) 4th Year

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
(i)	Maintenance of plants including shrub cutting, weeding	0	0		0
(ii)	Watch & ward per RKM	91	13650		13650
	Total	91	13650		13650

Abstract

Sl. No.	Item of Work	Man days	Labour cost @ Rs. 150/-	Material cost in Rs.	Total cost in Rs.
1	Cost of nursery	14	2100	400	2500
2	0th Year (except nursery)	25.5	3825	2150	5975
3	1st Year (except nursery)	136	20400	700	21100
4	2nd Year	208.5	31275	825	32100
5	3rd Year	101	15150	0	15150
6	4th Year	91	13650	0	13650
	Total	**576**	**86400**	**4075**	**90475**

Additional Cost

Cost of Bamboo gabion (Rs. 175/-each)

(Specification-Height-2m, Dia-0.6 m)

Per plant Rs. 362/- + Gabion Rs. 175/- & maintenance Rs. 175/- = Rs. 712/-

iii. Green Belt Plantation to be done in Phase-II:

Green Belt Plantation will be raised in colonies where the project Execution Staffs will reside within the length of 70.0 km. It is hopeful that five such colonies mainly comprising of Office location of Executive Engineer will come up. At this stage it can be estimated that approximately 2.0 ha of green belt can be raised at each location and thus 5 locations, 10.0 ha of plantation will be block model.

- **Plantation Techniques**: In the laterite bed area, foreign fertile soil will be provided to the pits. During planting the basal dose DAP-50 grams, insecticides dust 5 grams should be applied in each pit. The plantation will be in Block model i.e. 1,600 plants per ha at a spacing of 2.5m x 2.5m.
- The cost estimates will be 10.0 ha x Rs. 95,085/- per Ha= **Rs. 9,58,050 (Rs. 0.095 Crores)**

Cost Norms for Block Plantation (0+9th year) with maintenance

COST ESTIMATE FOR BLOCK PLANTATION OF 1600 SEEDLINGS/PER Ha.

1	Type of the Plantation	Block Plantation
2	No. of seedlings to be planted	1600 no.s per hectare
3	Spacing to be adopted	2.5m x 2.5m
4	Size of pits	30cm x 30cm x 30cm
5	Wage rate	Rs. 150/- per manday
6	Species to be planted	Neem (*Azadirachta indica* Karanjia (Pongamia glabra Asan (*Terminalia belerica* Siris (*Albizia lebbek* Sisso (*Dalbergia sissoo*)

0th Year (Advance work) Pre-planting operations

Sl. No.	Item of work	Man days	Labour rate @ Rs.150/-	Material cost	Total
1	Survey, Demarcation & pillar posting	2	300.00	-	300.00
2	Site preparation	12	1800.00	-	1800.00
3	Alignment and spacing of pits	2	300.00	-	300.00
4	Digging of pitting (30 cm cube)	40	6000.00	-	6000.00
5	Nursery cost (one year old seedling)part	80	8000.00	6000.00	12000.00
6	Contingencies & overheads	3	0	0	450.00
Sub Total		**139**	**14400.00**	**6000.00**	**20850.00**
1st Year Planting					
7	Cost of raising 1600 seedlings (Balance)	25	3150.00	600.00	3750.00
8	Carriage of seedlings to site cleaning including casualty replacement	30	4500.00		4500.00
9	Cost of insecticide & fertilizer	24	0	3600.00	3600.00
10	1st Weeding	10	1500.00		1500.00
11	Manuring	5	750.00	0	750.00
12	2nd Weeding	6	900.00		900.00
13	Soil working	8	1200.00		1200.00
14	Fire line tracing & Inspection patch	3	450.00	0	450.00
15	Soil conservation measures in the form of contour trenches of 2mt x 50cm D & drainage line treatment percolation pits	10	1500.00	0	1500.00

	etc.				
16	Watch & ward and brush wood/live fencing at 15% length of periphery to prevent cattle entry	15	2250.00	0	2250.00
17	Contingencies & overheads	4	0	0	600.00
Sub Total		**140**	**16200.00**	**4200.00**	**21000.00**
2nd Year Maintenance					
18	Causality replacement with nursery cost	12	1800.00		1800.00
19	Weeding	8	1200.00		1200.00
20	Application of Fertilizer	4	600.00	0	600.00
21	Cost of fertilizer	12	0	1800.00	1800.00
22	Soil working	7	1050.00		1050.00
23	Fire line tracing	3	450.00		450.00
24	Watch and ward	18	2700.00	0	2700.00
25	Contingencies & overheads	3	0	0	450.00
Sub Total		**67**	**7800.00**	**1800.00**	**10050.00**
3rd Year maintenance					
26	Weeding and pruning	8	1200.00		1200.00
27	Cost of Fertilizer	12	0	1800.00	1800.00
28	Soil working	8	1200.00		1200.00
29	Fine line tracing	3	450.00		450.00
30	Watch and ward	18	2700.00		2700.00
31	Contingencies	3			450.00
Sub Total		**52**	**5550.00**	**1800.00**	**7800.00**
4th Year maintenance					
32	Weeding & pruning	8	1200.00		1200.00
33	Fire line tracing (2 mt. wide fire line over 400 mt. long)	3	450.00		450.00
34	Watch and ward	18	2700.00		2700.00
35	Contingencies	3			450.00
Sub Total		**32**	**4350.00**	**0**	**4800.00**

5th Year maintenance					
36	Weeding and pruning	8	1200.00		1200.00
37	Fire line tracing (2 mt. wide fire line over 400 mt. long)	3	450.00		450.00
38	Watch and ward	18	2700.00		2700.00
39	Contingencies	3			450.00
Sub Total		**32**	**4350.00**		**4800.00**
6th Year maintenance					
40	Weeding and pruning	8	1200.00		1200.00
41	Fire line tracing (2mt. wide fire line over 400 mt. long)	3	450.00		450.00
42	Watch and ward	18	2700.00		2700.00
43	Contingencies	3			450.00
	Sub Total	**32**	**4350.00**	**0**	**4800.00**
7th Year maintenance					
42	Watch and ward	18	2700.00		2700.00
43	Contingencies	3			450.00
	Sub Total	**32**	**4350.00**	**0**	**3150.00**
8th Year maintenance					
42	Watch and ward	18	2700.00		2700.00
43	Contingencies	3			450.00
	Sub Total	**32**	**4350.00**	**0**	**3150.00**
9th Year maintenance					
42	Watch and ward	18	2700.00		2700.00
43	Contingencies	3			450.00
	Sub Total	**32**	**4350.00**	**0**	**3150.00**
Grand Total		590	**70050.00**	**13800.00**	**83550.00**

ABSTRACT FOR @ 1600/- SEEDLINGS PER Ha.

Year	Labour	Material	Contingencies	Total
0th Year	14400.00	6000.00	450.00	20850.00
1st Year	16200.00	4200.00	600.00	21000.00
2nd Year	7800.00	1800.00	450.00	10050.00
3rd Year	5550.00	1800.00	450.00	7800.00
4th Year	4350.00	0	450.00	4800.00

5th Year	4350.00	0	450.00	4800.00
6th Year	4350.00	0	450.00	4800.00
7th Year	4350.00	0	450.00	3150.00
8th Year	4350.00	0	450.00	3150.00
9th Year	4350.00	0	450.00	3150.00
Total	**70050.00**	**13800.00**	**4650.00**	**83550.00**
	467	92	31	557
Additional incentive (3%)for VSS/Fr/FG proposed for more than 80% survival and very good growth during 4th year of maintenance as per recommendation of DFO and RCCF				1935.00
Additional EPA expenses if implemented through VSS at rate Rs. 1200/- in 0th Year, Rs. 2400/- in 1st Year, Rs. 1800 in 2nd Year ,Rs.600/- in 3rd Year, Rs.600/- in 4th Year, Rs.600/- in 5th Year, Rs. 600/- in 6th Year, Rs. 600/- in 7th Year, Rs. 600/- in 8th Year, Rs. 600/- in 9th Year				9600.00
Total Norm per ha.				**95,085.00**

iv. Protection to forests by engaging rural youth in Phase -II.

Village youth of the adjacent villages of Birasal Reserved Forests and Mahagiri D.P.F. will be engaged for protection of the vegetation and do not allow illicit felling and grazing. This will facilitate rejuvenation of the forest which will eventually provide shelter and food to the Elephants in particular and other wildlife in general.

The cost norm is as follows:-

10 watchers for Birasal R.F. and 10 watchers for Mahagiri DPF = 20 watchers to be engaged for ten years.

20 Watchers x Rs. 4,500/- per month x 120 months = Rs.1.08 crores + 20 % escalation Rs.0.21 crores = **Rs.1.296 crores**.

Abstracts of item B

Sl. No.	Details of Works	Target	Cost (Rs. in Lakhs)
1	Canal Bank Plantation **(B1)**	63.0 km	181.43
2	Avenue Plantation **(B2)**	9.0 km	31.95
3	Green Belt Plantation	10.0 ha	9.50
4	Protection of Forests by engaging Village Youth **(B3)**	20 no.s	12. 96
5	Corpus fund	To be provided both the DFOs.	200.00
Total			**435. 84 (Say 4 Crore36 Lakhs)**

V. Number of trees proposed for Plantation

- **Canal Bank Plantation:**
  - along the main canal for 53km of effective length = 50400 Nos.
  - avenue plantation for 9km of selective roads @250 plants / km = 2250 Nos.
  - Green belt plantation in staff colonies (for 5 colonies each for 2ha and @1600/ha) =16000 Nos.

Total trees to be planted under new plantation = 68650 nos.

ANALYSIS:

- As against felling of 920 trees, the Project Authority proposes to plant 68650 no.s of trees which is 74.6 times extra over the loss.
- Plantation along Branch canal and distributaries have not been accounted for to remain within budgetary provision.

C. FINANCIAL PROGRAMME COMPONENT:

Flow chart for financial part is furnished in the following Table.

Table Showing Annual Flow Chart of Financial Part for Plantation Activities

Sl. No.	Type of interventions	Target	0th + 1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year	Total
1	Canal Bank Plantation	63.0 km	17.136	42.336	64.008	30.740	27.210						181.43
2	Avenue Plantation	9.0 km	9.41	11.65	5.71	2.75	2.43						31.95
3	Green Belt Plantation	10.0 ha	4.545	1.185	0.84	0.7335	0.54	0.54	0.375	0.375	0.375	--	9.508
4	Protection of Forest by engaging of Village youth	20 no.s	1.296	1.296	1.296	1.296	1.296	1.296	1.296	1.296	1.296	1.296	12.96
5	Corpus Fund	Two Divisional Forest Officers Cuttack/ Dhenkanal	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	200
	Total		51.2206	75.3006	90.6876	54.3531	50.3096	20.6696	20.5046	20.5046	20.5046	20.1296	**435. 848**

5.1.1.3 Impact on drainage of the study Area:

[A] Restoration of Natural Stream flow in the study Area:

In the baseline study it was indicated that the command area of LBC–II Phase–II is well drained by two major river systems i.e. Rivers Brahmani and Baitarani. In their respective basins; large number of tributaries fed by their Secondary and tertiary drains which are spread throughout the ayacut area.

Prediction of Impact:

The major Left Bank Main Canal and its distribution Canal system ought to intercept these natural drains on their traverse/alignment. Since these drains are responsible to carry the inflow / runoff from rainfall precipitations in the study area; their natural flow should be restored effectively against any likely hindrance that may be caused by crossing of the canals.

Mitigation measure:

- The project authorities during the ayacut survey have identified those crossing points where the natural streams and drains appear in the Canal alignment.
- Appropriate crossing structures will be provided while designing the Canal Construction.
- In the Main Canal alignment 69 no.s of cross drainage (CD) structures have been provided. Similarly, about 674 no.s of CD structures have been proposed in the Branch Canal, Distributary, Minors and Sub minors.
- Of these, one major aqueduct has been proposed at RD 124.25 km of LBC when it is to cross the Kusei River.

[B] Pollution effect on surface Drains:

Due to irrigation facilities, the farmers may adhere to extensive agriculture practises where in soil nutrients and excess doses of chemical fertilizers and pesticides may be drained to the nearest stream flow and pollute the water.

Mitigation measure: Following mitigative activities are suggested.

- Drainage from the farm land should be regulated with field drains and catch drains.
- Appropriate application of soil nutrients should be ensured through the advice from agriculture extension officials.
- Balanced doses of chemical fertilizers and more of Bio–fertilizers should be ensured with scientific method of application.

- On receipt of soil nutrients resulting from field drainage, some small valley drains often develop weed growth on the bed of the drains and result clogging of flow. The farmers should be motivated to keep the drains clean before onset of monsoon through PPP mode.
- There is a budgetary provision of Rs.254.60 Million in the project cost estimate for Management of Natural drains.

5.1.1.4 Impact on existing Historical & Archaeological Monuments and Cultural activities:

The Left main canal and its distribution networks have been carefully planned so as to avoid interference of any historical and archaeological monuments existing in the locality.

Analysis: This development project, mostly featured with new network of Canal system, does not cause any adverse impacts on the existing cultural activities, religious places and places having archaeological monuments. On the contrary, creation of new water bodies like canals extended communications facilities in shape of canal bank roads and road bridges would contribute positive impacts on Socio-Cultural Status.

5.1.1.5 Impacts on existing communication and transport facilities:

The subproject comprising of wide network of canal system on land would normally cast adverse impact on the existing road communication in the locality when these roads are intercepted by the canal alignment.

In fact, the Left Bank Canal (LBC) negotiates two major crossing in its alignments, namely one Express Highway Crossing at RD 104.20 km and one Railway Crossing at RD 109.468 km apart from several MDR and village road crossings.

Mitigation measure:

The project authorities have foreseen the negative impacts on communications and transport facilities and proposed construction of appropriate engineering structures against such future disruption of communication system. In the design statements prepared for canal construction, the following road and railway crossing have been considered.

Table No. C5-9: Structures proposed for road / railways crossing

Sl. No.	Particulars	MDR Crossing (Nos)	VRB NH/SH (Nos)	VRB Cum Fall (Nos)	Total (Nos)
1.	LBC (Reach – I 71.313 km to 100.49km)	----	21	-----	21
2.	LBC (Reach – II 100.49kmto 149.00km)	----	39	----	39
3.	Distributary, Minors and Sub minors of Reach I	133	338	8	479
4.	Distributaries, Minors and Sub minors of Reach II	223	578	----	801
Total		**356**	**976**	**8**	**1340**

- Project authorities would obtain permission from concerned NH/ Road District authorities under the State Govt. and Railway Authorities of the Govt. of India for construction of appropriate crossing structures.
- As such the anticipated adverse impact will be reduced to negligible after providing safe crossing structures over the canal.
- On the other hand, the existing road communication and transport facilities will be improved to a great extent by construction of new canal bank roads which would link the existing road system of the region. This is rather a positive impact anticipated by the project.
- There is a budgetary provision of Rs. 226.10 Million kept in the Project Cost estimate for improvement of communication & transport facilities.

5.1.1.6 Impact on Affected villages/properties and population:

Sl. No.	Name of the Canal	No. of affected person (Land owner)	Compensation/Resettlement necessary		
			Land in Ac.	House hold Nos.	Squatters Nos.
1	Sub- Total of LBC (71.313 to 100.49 km)	10469	1834.99	111	66
2	Sub- Total of LBC (100.49 to 141.00 km)	1799	844.51	29	112
3	Sub - Total of Distributaries (100.49 to 141.00 km)	14142	3029.51	35	26
	Grand Total	**26410**	**5709.01**	**175**	**204**

5.1.2 Impact Due To Project Design:

Various impacts considered under the project design criteria are:

- Water quality (Both Surface & Ground water).
- Risks of water logging and soil salinity.
- Design of hydraulic structures.
- Soil quality.
- Seismicity and risks due to earth quake.

5.1.2.1 Water Quality:

Approach:

- The quality of water in the Left Bank Canal need to be thoroughly examined against possible pollution parameters as it may adversely affect the principal project objective i.e. water use for irrigation & agriculture development.
- Assessment of pollution parameters at the supply source i.e. at Samal Barrage Pond and in the Left Bank Canal at its completed Reach have been carried out in the Baseline study. As because, water quality of some ponds and water bodies inside the command area may be adversely affected due to introduction of irrigated agriculture; pre-project sampling and water quality tests were carried out simultaneously at a seasonal time scale (Monsoon & Post monsoon study).
- Results of water quality Tests furnished in 3.8.4.3 & 3.8.4.4 Chapter 3 of this document. These results are analysed and compared with tolerance Limits for inland surface water quality standards prescribed by CPCB.

5.1.2.2 Risks of Water logging & Soil Salinity:

The project basically focuses on irrigation and agricultural development, where water is applied to the agricultural field and allowed to stand for a calculated period according to the cropping pattern. The project design must include dissemination of water-efficient methods of irrigation, in absence of which critical phenomenon like water logging and soil salinity may emerge in certain low lying areas, detrimental to crop yield / crop sustenance.

A. Water Logging

Water logging occurs due to steady rise of ground water table after introduction of irrigated agriculture without adequate land drainage. This phenomenon is most anticipated in certain low lying patches.

As land begins to get water logged, the crop yields begin to decline. If this water logging situation prevails for a longer period with gradual increase then, at certain stage farming becomes uneconomical due to development of soil salinity. This turns out to be an irreversible impact on agricultural production.

(a) Analysis

According to the baseline assessment of ground water table in the command area, the following location exhibit high water level during the post monsoon survey. [Table No. C3-11 of chapter 3]

Attributable

- Low lying agricultural fields
- Insufficient natural surface drainage
- Inadequate ground water use
- Soil quality / permeability of Agricultural land
- Anticipated seepage from proposed canal banks
- Anticipated return flow from higher lands

B. Salinity

- Salinity refers to concentrate of Chlorides and Sulphates of Sodium, Calcium and Magnesium in soils at a level that would adversely affect the plant growth.
- Alkaline soils contain more of exchangeable sodium to cause an increase of pH value and maintain a Sodium Absorption Ratio (SAR) value more than 15.
- Salinity may be endemic to soils in some typical areas but in most case of irrigated agriculture it is contributed by "Water Logging".
- Salinity resulting from water logging relates to the criteria of upward movement of soluble salts in the soils through plant roots. In the event of severe water logging for a longer period, a salt crust may appear at the root zone.
- Reclamation land affected by Salinity and Alkalinity is possible but expensive and time consuming. It can be removed by scraping / leaching with excess water and by chemical method.

Analysis

During the baseline study of the project; soil samples taken from strategic location of the command area have been taken for laboratory analysis so as to identify areas which area alkaline by natural occurrence. **[Reference to Table No. C3-6 of Chapter 3]**

Areas having alkaline soils are not noticed in the command area of the project.

The project design should be modified through monitoring mechanism and containing appropriate mitigation measures.

C. Mitigation Measures

The project design should be modified to entertain preventive measures as mentioned below.

Box No. 9: Preventive measures against Water logging & Salinity

Impact	Item	Preventive Measures Proposed
Water Logging	Drainage	• Improve existing drainage system by cleaning weeding. • Provide adequate field drains during cultivation.
	Leakage & Seepage from canals	• Ensure proper maintenance of canal embankments against any leakages. • Ensure proper design of canal section to prevent excess seepage - Provide catch drains and concrete lining of the section.
	Conjunctive use of Ground water	• Where water logging is severe, ensure withdrawal of excess recharge by pumping. • Consult Ground Water Survey & Investigation (GWSI) Lift Irrigation Organisation of DoWR for conjunctive use of Ground water and planning for a lift ayacut.
	Water efficient method of irrigation	• Ensure optimization of water use by consulting agriculture experts. • Reduce canal supply by control arrangements. • Plan out effective water conservation measures.
Salinity	Leaching Method	• Attempt must be taken to prevent causing of salinity from the initial stage. • Reclamation may be attempted by periodic flushing of the affected land.
	Chemical Method	• Chemical treatment method may be adopted in consultation with Agriculture counter part of DoWR, Govt. of Odisha. • Ensure use of Nitrogen base fertilizers as well as organic manure as per their recommendation.
	Motivation & Farmer's Training	• The farmers of such water logged areas should be educated to use water efficient method – Selection of suitable water resistant crop cultivation and adopt preventive measures.

5.1.2.3 Design of Hydraulic Structures:

The subproject LBC-II Phase-II being an effective arrangement to distribute canal water on to the fields for agricultural development; prior attention should be given to adequate provision of structures in the canal system to prevent likely impact due to erosion & siltation, formation of Aquatic weeds and crossing of canal barrier by human and wildlife population.

(a) Against Erosion & Siltation:

From the monitoring of baseline situation, it is revealed that,

- Erosion control measures at the source have been effectively taken through adequate plantation technologies around the Samal Barrage Pond.
- Silt excluders are provided in the body of the Barrage structure to prevent silt intrusion in to its canal systems.
- Erosion control measures in the canal banks for the completed phases have been taken through provision of canal lining & canal bank plantation.

With the above in the perspective, the proposed canal system under phase II (RD 71.313 km to 141.00 km) will experience much less adverse impact due to bank erosion and siltation after ensuring adequate control measures.

(b) Aquatic weeds in the canal system:

Impact:

- The barrage Pond as the supply source and its canal system in the time span may become infested with aquatic weeds which may be submerged or floating type. Weeds in the pond are undesirable.
- Such weed formation inside the canal section results increase in water losses by higher evapo-transpiration, thereby reducing the flow velocity and carrying capacity of the canal.
- Weeds are also responsible for providing habitat of water borne disease vectors and adversely affect the fish species by causing reduction of Dissolved Oxygen levels in the water body.

Findings from Baseline Study:

- From the field study of previous phase (LBC-II Phase-I), it is ascertained that there was no cases of aquatic weed formation in the main canal because of its high velocity and canal lining.
- However, weed infestation may occur in minors and sub-minors.

- Aquatic weed control measures are discussed in the Weed Management Plan (Chapter 6).

(c) Hydraulic Structures for Canal Crossings:

Environmental problems may arise when the canal forms a barrier against, natural movement of human population, cattle folk and wild animals of the locality. Crossing of natural streams & drains appearing in the canal alignment is another critical environmental issue.

During survey of the ayacut, such critical issues were surveyed and inventory maintained to help design of the canal system. Upon consultation of the DoWR records it is ascertained that the design engineers have kept adequate provision for crossing of the canal.

The Design statement for Left Bank Canal phase II from RD 71.313 km to 141.00 km along with its distribution network consists of the following canal crossings.

Box No.10: Canal Crossing

Canal Crossing	**Main Canal**	**Distribution System**
Major District Road Crossing	--	356 no.s
Village Road Crossings	58 no.s	924 no.s
NH/ Express Highway crossings	2 no.s	--
Total Road Bridges provided	**60 no.s**	**1280 no.s**
Stream Crossing (CD structures)	69 no.s	674 no.s

According to the recommendation of Chief Conservator of Forest and Wild life warden of Odisha wild life i.e. Elephant paths have been identified in the previous phase up to 71.313 km. Appropriate crossing structures are already completed for phase-I works.

Box No. 11: Wild life (Elephant Crossings in Phase -1)

In the LBC from 00 to 71.313 Km	9 no.s Elephant friendly Ramps (EFR) and 1 No's Super passage / Bridge
In prajang Branch Canal	6 no.s Elephant friendly Ramps
In Bhairpur Branch Canal	12 no.s Elephant friendly Ramps
Total	**28 no.s**

The project authorities have engaged wildlife experts to identify elephant crossing locations in the Canal System for LBC-II Phase-I from 0.00 km to 71.313 km. Such locations are furnished in Table No. C3-20

5.1.2.4 Soil Quality:

This irrigation subproject is basically an agricultural development scheme in which physiography of the command area and physical as well as physiochemical properties of soils play an important role. Status descriptions of the above components according to the baseline assessment study are contained in **Chapter–3** of this document. The results are analysed to determine the suitability of command area soils for irrigated agriculture, interalia decision making inputs for designing the cropping pattern and crop water requirement.

5.1.2.5 Seismicity & Risks due to Earth Quake:

- Seismicity of the study area has been studied from literature review and consultation of IMD data. Details furnished in chapter 3.
- According to seismic Zoning Map of India, the state of Odisha comes under seismic zone II & III.
- The concerned districts Dhenkanal, Jajpur and Keonjhar form the North Eastern part of the state.
- The seismic coefficient will be considered while designing the civil Engineering structures.
- Future risks due to severe earthquake and resulting hazards are thus reduced to negligible.

5.1.3 Impact Due To Project Construction:

This Left Bank Canal Subproject is scheduled for eleven years of implementation period during which the construction activities will prevail for the entire 11 years period, besides some activities under soft components. Although the environmental impacts during the construction period are mostly of temporary nature, some critical components contributing to environmental hazards need to be identified, evaluated and mitigation measures proposed. Some of those components having negative impacts are;

- Soil Erosion
- Solid Waste disposal
- Water pollution
- Air pollution
- Noise Pollution & Vibration Impact
- Cultural and Social Conflicts

- Risks of Accident in Construction sites
- Impact on sensitive Receptors

Predictions of Impacts due to the above Environmental components are briefed below.

5.1.3.1 Soil Erosion:

Normal erosion of land in the natural environment refers to the removal of soil particles by the wearing activities of water, wind, Ice, and gravity etc having undisturbed human influence. But during the implementation of development projects 'Soil Erosion' may appear as a significant phenomenon attached to environmental consideration.

For Rengali Irrigation project comprising of construction of a Barrage structure across River Brahmani; Creation of a Pond storage; construction of canal network including many structures and application of water for irrigation etc, soil erosion has been contemplated by the project planners in its two distinct phases of implementation i.e.

- Soil erosion during construction phase
- Soil erosion during operation phase

A. Erosion during construction period:

Sl. No.	Activities	Impact	Mitigation Measures	Management Plan
1	Natural erosion of soil in the pond periphery and loss of forest cover	• Excess silt flow into the pond water body. • Reduction of life of project	• Catchment treatment methods • Plantation / Dense vegetation at the pond periphery	Plantation activities already undertaken by DFO, Deogarh & DFO, Dhenkanal
2	Excavation of canal— spoil disposal & Borrowing of earth	• Erosion in canal slope & reducing flow efficiency • Removal of forest cover for the design	• Lining is recommended for inside of canal slopes • Compensatory afforestation plan to be	• Concrete lining is proposed. • Funds deposited to Forest Department

		section of canal • Scenic disturbance due to erratic spoil Banks	implemented. • Canal Bank plantation to be implemented. • Implementation through contractual provisions. • Disposal of spoils at approved locations with vegetative cover. • Country side slope to be turfed. • Slope drains to be constructed	
3	Construction of structures	• Risk involved in the cut & cover section of canal • Irregular spoil disposal	• To ensure adequate safety measures • Ensure planned spoil disposal at the approved locations.	Project Authorities (PA) should ensure mitigation measures through contractual provisions
4	Borrowing of earth & mining of minor minerals	• Un-replenished borrow pits are potential areas of health hazards / vector breeding places. • Increases land denudation process of the Quarry site	• To ensure Borrow area back filling; construction area level etc. • Refill the excavated pockets & stabilized slopes	Project Authority to ensure environmental compatibility through provision in contractual agreement / proper monitoring after execution.

5.1.3.2 Solid Waste Disposal:

- Areas for solid waste disposal either in shape of construction debris or domestic wastes from camping sites should be planned prior to execution of works. In this connection the Regional Revenue Authorities may be consulted for identification of dumping sites.
- Care must be taken while transporting the construction debris. Trucks and dumpers carrying the debris and plying on public roads should use tarpaulin cover.
- During construction of structure, the localised concreting should be avoided as far as practicable. Concrete should preferably be obtained from batching plants, suitably located. All construction spoils should be removed after the works are completed.

5.1.3.3 Water Pollution:

IMPACT PREDICTION

(A) During Construction Period

Sl. No.	Activity	Impact	Proposed Mitigation Measures
1.	Unscrupulous disposal of construction wastes when led into the nearest water body	Increase in various pollution parameters beyond the tolerance limit	• Construction wastes should not be allowed to be deposited near any water body • Prevent unscrupulous disposal of wastes in a drainage course
2.	Washouts released to the water body during the maintenance of machinery and equipment	Water pollution due to oil & grease and some toxic soluble present in the effluent release.	• Workshops and repair sheds should not be located near a water body • Prevent effluent flow to water body by using soak pits.
3.	Locating construction camps/labour camps near any water body	Bacterial pollution anticipated through use of water body by imported labour force. Cause of Health hazard to the local population	Contract agency should be directed to establish temporary camps on approved locations
4.	Using local ponds for construction water requirement	Conflict of water use by local population	Construction water supply to be met by tanker.

(B) Pollution of Ground water

Sl. No.	Activity	Impact	Proposed mitigation measures
1.	Ground water strata may be met with during Tunnel	Ground water pollution is likely due to leaching	- Tunnel Boring operation should be

	Boring operation	of chemicals	conducted during summer months when the Ground water table remains low. - Ensure effective pumping from tunnel construction area

5.1.3.4 Air Pollution:

- Adverse Impact on Ambient Air Quality related to this irrigation project is not anticipated except for a temporary period spanning the construction phase.
- Ambient Air Quality data already assessed at baseline conditions have been furnished in Chapter−3 of this document.
- Anticipated minor impact which may usually occur during the construction phase along with its mitigation measures are described below.

Sl. No.	Activities	Mitigation Measures
1	Operation of Machineries and construction equipment's	• Diesel operated earth moving machineries likely to be used during construction period may have CO emission at localised areas. • Operation of such machineries and equipment's should be maintained with time & space.
2	Generation of dust	• There may be increase in the particulate concentration of air at specific construction sites. • Dust generation at localised sites should be minimized by water sprinklings.
3	Traffic concentration	• Public roads in village areas may be used by trucks and dumpers to carry construction materials. • Such roads should be maintained by the contract agencies with periodic water sprinkling by tanker mounted vehicles.
4	Monitoring of Air Quality	• Monitoring of Air quality at strategic locations should be conducted during construction period

5.1.3.5 Noise Pollution & Impact Due To Vibration:

NOISE IMPACT

In case of this irrigation project, the connected activities spread through many kilometres (70 km for the main canal only) where in the noise & vibration impacts may exist for a limited period during the construction phase. The point source may be distantly located with minimum exposure time according to the machineries used and activities involved. Although there may be almost no noise pollution anticipated during the operation phase study has been limited to assessment of Impact due to Noise emission during the construction phase.

Pre-project noise level measurements have been recorded by the Consultants and results furnished in Chapter-3; Table C3-14 of this report.

Impact during Construction phase:

i) Impact due to running of machineries and equipments engaged for construction works.

Forecasted Noise levels for various machineries to be used are indicated in **Table No. C5-10**

Table No. C5-10: Forecasted Noise Levels

Sl. No.	Machineries Particulars	Noise levels in dB (A) without Noise Controls	
		At Source	At 15 m (50 ft)
1	1.5 Cum capacity Excavator loader	109	85
2	8.33 Cum capacity Rear end dumpers	108	84
3	Dozers	109	85
4	Heavy duty jack hammers	109	85
5	Compressors	104	80
6	Generators	105	81
7	Rock Drills	122	98

Source: "Construction equipment Noise levels and Ranges Report" of Federal highway Administration (RITES Report for MMRC)

- Amongst these machineries & equipments, any one or two will be in operation at a particular location of the spread construction areas. As such, the Noise emission will be further reduced to minimum level

beyond 100 m distance from the point source; when considered with space and time of exposure aspects.

- Compressors will be located at a distance from the operations areas of Rock drills in case of hard rock excavation by blasting. Temporary pipeline will be laid for this purpose.

ii) **Blasting by explosives:**

- Blasting operations will be restricted to areas where hard work excavations are required. Such sites are likely to appear at distantly spaced locations.
- The exposure time for Blasting may be for a very short time (Between 5 to 10 minutes) during morning (sun rise) and afternoon (sun set) period of any day.
- Although there be high noise level at the point source (Beyond 120 dB(A)) it will be dissipated beyond the demarcated boundary of 400 m/500 m (safe Blasting zone according explosive guidelines)
- However the construction agency will be directed to reduce the noise due to blasting by using recommended methods of controlled blasting.

iii) Noise Impact due to running of transport vehicles:

- Trucks & Dumpers may use village roads for transporting construction materials as well as engaged for waste disposals.
- There may be noise pollution to the locality if several vehicles are allowed to run at a specific time.
- The construction agency to ensure time gap between their running as well as to ensure proper maintenance as a noise reduction measure.

Mitigation Measures:

Following mitigation measures will be taken care of to control noise pollution in the project area.

- Low noise producing machineries and equipments needs to be selected
- Preventive maintenance of machineries will be ensured.
- Periodic repair and maintenance of vehicles, machineries and equipments to be done.
- By limiting or reducing the noise exposure time of workers.
- Personnel working in noise zone will use ear plugs or sit in closed cabins.
- Construction work to be restricted to day time only.
- Blasting operations to follow explosive guidelines.

VIBRATION IMPACT:

- Impact due to vibration will be experienced for a temporary period during construction of tunnel proposed at RD 100.49 km to 103.46 km of the main canal alignment.
- One hamlet at "Panaspal" located at 100m Left of LBC at RD 100.49 km and a part of Revenue village "Dhamanagadia" at RD 102.15km of LBC are likely to be affected due to vibration impact of tunnel Boring Machine.
- For people in their residence, the lower threshold for annoyance is 72vdB (FTA 2006) [Ref: US Department of Transportation 1998]
- The ground borne vibrations caused by tunnelling operations may result in community annoyance & increased health hazards.

Mitigation Measures:

No specific vibration control measures are required as TBM ground vibration is generally not a concern in this particular case, however, following precautions will be taken during the operation to minimize the vibration levels.

- Reducing RPM decreases overall vibration dosage, but prolongs tunnelling programme.
- For typical rock, optimal penetration rate (PR) (5 to 10 mm/rev), where vibration levels achieve maximum.
- Further increasing the PR would not further increase the vibration levels, but decrease the overall vibration dosage. Only observed in "typical rock", may not apply to "stiff rock"
- For minimization of overall vibration impact, slower RPM and higher PR may be considered.
- Tunnelling hours shall be limited.
- Information dissemination about the construction method, probable effects, quality control measures and precautions to be used.

5.1.3.6 Cultural & Social Conflicts:

- Issues like cultural and social conflicts may arise during the construction period when the migrated labour forces are camped very near to the endemic habitations of the locality.
- The host population / villages do not normally accept the migrated labourers to interface / participate in their social and cultural activities. They are apprehensive of theft by miscreants, infection from foreign borne alien diseases and destruction of ecology and environment.

- The preventive measures proposed by the project authorities to be undertaken at labour camps are:
  - Locating the labour camps away from the existing village areas.
  - Provide free fuel to each of the migrated family in the camp so as to prevent unscrupulous cutting of trees and bushes for search of fuel wood.
  - Ensure free periodic health check-up at temporary labour camps.
  - The construction agency to look after their basic needs like food supply & grocery requirements, improved sanitation facilities, safe drinking water supply through deep borewells, electrifications of the area and ensure providing safe sewage disposal methods (Latrines with septic tank and soak pit Provision)

5.1.3.7 Risks of Accidents in Construction Sites:

- Some skilled persons imported from the outside localities and local labours forces are to be engaged by contractors during the construction period.
- Periodic inspection and effective maintenance of vehicles and equipment.
- Avoid night time activities
- Use safety equipments in construction sites and warning signs and safety instruction to be deployed.
- The general public/local residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation.
- Speed restrictions shall be imposed on Project vehicles and equipment when traversing areas with sensitive receptors (residential, schools, temples, etc.).
- All lifting tools and tackles will be periodically checked & certified.
- Due attention will be given to their basic needs and amenities as well as free health check-up facilities.
- There may be stray cases of accidents at construction sites which may adversely affect the work atmosphere.
- Mitigation measures planned by the project authorities should include.
  - Provision of First Aid facilities at the worksite to be provided by the construction agencies.

- The project authorities have proposed to provide ambulance facilities for serious accident victims, who may be transported to the nearest Govt. / Private Hospitals / Health Centres.

Table No. C5-11: Existing Health Care Infrastructure

District	Block	Hospital	PHCs	Community Health Centre	Sub Centres
Dhenkanal	Kankadahada	2	2	1	16
	Bhuban	1	4	3	15
Jajpur	Danagadi	----	4	----	17
	Korei	----	6	1	22
	Rasulgarh	----	5	1	27
	Sukinda	----	4	1	21
	Jajpur	1	----	----	
Keonjhar	Anandpur	1	----	----	----
	Ghasipura	1	8	1	23

Source: District Statistical Hand Book-2009

Preventive Measures:

Review of safety measures will be undertaken by Project Monitoring Unit of DoWR by first week of every month. If necessary there will be field verification to critical areas like tunnel construction site and aqueducts etc.

5.1.3.8 Impact on Sensitive Receptors:

- Sensitive receptors have been identified around the left Bank canal through site verification and Map study
- Amongst those sensitive Receptors, some existing institutions like schools and colleges, Ashram schools old age homes, Hospitals and Nursing homes. Historical and Archaeological Monuments etc were searched for within 500 m and 1000 m from the left canal alignment.
- Due to time constraint the field study & verification could not be carried out for all those Branch canals. Distribution minors etc. However Impact on sensitive receptors assessed around the main canal may be rationally made applicable for the huge distribution network (for 72967 Ha)
- The list of Sensitive Receptors has been furnished in chapter 3 Table No. C3.22 & C3-23. The map showing sensitive Receptors are furnished in Fig.No.C3-16.

i) Impact due to persistent noise and vibration

Safety of structures

High vibration effect will cause adverse impact on permanent structures/Buildings within 100 m from point source.

Health Hazard

- Excess noise beyond tolerance limit will affect the human hearing system
- Some senior citizens may develop Noise problems due to the irritation effect induced by Noise & Vibration.
- Impact due to excess noise and vibration may divert the attention of children in school and disturb the study atmosphere.

ii) Impact due to Vibration:

Impact due to vibration is anticipated in the segment 2 i.e. between RD 100.49 km to 103.50 km where the ground borne vibration impacts may be somewhat perceptible to people who are outdoors. The Noise generated by tunnel Boring Machine during the daytime will never be annoying to local inhabitants. [Ref. EIA for Mumbai Metro Rail Corridor by RITES].

The construction of a Tunnel is scheduled however this vibration Impact will be experienced during the construction period only. Impact during the operation phase may not be significant subject to successful implementation of safety measures.

iii) Impact due to Noise:

Noise pollution is anticipated only during the construction period, while undertaking excavation, loading and transportation.

Prescribed Noise level for equipment & machinery during the construction period are furnished below.

Construction Noise Requirement:

Sl. No	Equipment's	Standards Noise level dBA (at 50ft)
1.	Earthmoving	
	• Front loader	75
	• Dozen	75
	• Scraper	80
	• Grader	75
	• Truck	75
2.	Machineries	
	• Pile driver	95
	• Jack hammer	75
	• Rock drill	80
3.	Material Handling	
	• Concrete Mixer	75
	• Concrete Pump	75
	• Crane	75
4.	Stationary	
	• Pump	75
	• Generator	75
	• Compressor	75
5.	Others	
	• Vibrators	75

- For sensitive receptors like Residential area schools, hospitals etc. the designed noise standards varies from leq = 67 to L10 = 70 (dBA) for developed lands the value comes between 72 to 75 dBA
- Since the sensitive receptors are mostly located beyond 50m (50m to 500m) the Noise pollution will be reduced to negligible value hence no serious Noise impact is contemplated.

4. Mitigation Measures & Management plan:

The management plan for control of vibration and Noise levels, as described in 7.2.4 and 7.2.5 of Chapter 7 in this report, shall be adhered to scrupulously so that the impact on sensitive receptors are brought down to the minimum.

- In addition to the above the project authorities would ensure that the tunnelling operation between RD 101.50 to 102.00 km should be carried out

during May & June months (Summer Vacation project) that the adverse impact on the school schedules are avoided.

- The project authority shall direct the construction agency to provide mechanism for receiving and responding to public complaints arising out of impact on sensitive receptors.
- Night time construction activities in the study area, especially near any receptors site should be avoided as far as practicable.

5.1.4 Impact Due to Project Operation:

Impacts on certain Environmental issues become more significant during the operation phase of the project. These issues have been broadly identified and related mitigation measures proposed in this section.

Areas identified for prediction of Impacts due to project operation are given below.

I. Soil erosion
II. Impact on Soil fertility.
III. Impact on Water Quality.
IV. Impact due to growth of aquatic weeds.
V. Impacts on command are due to water logging.
VI. Impact on Public Health.
VII. Impact on Socio–economic Status.
VIII. Impact due to Global warming and climate change.

The Negative Impacts Predicted for the above are briefed below.

5.1.4.1 Erosion anticipated during the operation period

In this irrigation project soil erosion is insignificant in the operation phase; except for ensuring protection of the excavated areas & strengthening vegetative cover. The only concerning part in the operation phase is continuous reduction of soil fertility attributed to removal of Nutrients through erosion.

- **Activity:**
  - The nutrients are commonly adsorbed over the soil particles especially present in the top layer of the agricultural land.
  - Due to Natural erosion on land, the top layers of the soil gets eroded and carried away along with the flow of irrigation supply; causing the nutrient loss.
- **Impact:**

- Due to nutrient loss, the crop output may be gradually depleted; which accounts for economics sustainability.
- Pollution of adjacent water bodies which may be receiving the field flow
- Grazing by cattle folks

➢ **Mitigation Measures:**

- Command Area Development and Water Management (CAD & WM) methods prescribed by CADA should be implemented; in which land leveling and scientific means of water application takes priority.
- Ensure regular soil testing and replenishment of Plant Nutrients.
- Plantation is proposed at the toe of country side slopes.
- Elephant friendly ramps are to be protected with boulder packing and grouting.
- Grazing by Cattle folks at maintained slopes, appearing adjacent to village areas should be discouraged through people's participation.
- Ensure periodic maintenance of rain cuts after rainy season.

5.1.4.2 Impact on Command Area Soils:

[A] Impact on Soil Fertility:

Irrigation water supply to the command area will be ensured for most of the months in a year to develop both Khariff and Rabi Crops, except for 4 months period when canal closure will be taken for maintenance.

Likely period of Canal Closure:

- 1st November to 15th December – 1 ½ months
- 1st April to 15th June – 2 ½ months
- Total – 4 months

Intensive crop cultivation on rotation basis may reduce the soil fertility to a considerate extent due to gradual nutrient removal process, water logging and development of soil salinity.

Nutrients:

- Primary Nutrients are: Nitrogen (N), Phosphorus (P) and Potassium (K).
- Secondary Nutrients are: Calcium (C), Magnesium (Mg) and Sulphur (S).
- Removal of Some primary Nutrients by different crops are given below.

Table No. C5-12: Nutrient Removal by Different Crops

Sl. No.	Name of the Crop	Nutrient Removal [Kg/Qntl.] of produce		
		N	P_2O_5	K_2O
1	Paddy (Rice)	2.01	1.12	3.00
2	Wheat	2.45	0.86	3.28
3	Maize	2.63	1.39	3.58
4	Black Gram	7.87	1.43	6.70
5	Green Gram	9.11	3.20	12.00
6	Ground Nut	5.81	1.96	3.01
7	Potato	0.72	0.18	0.80
8	Sugarcane	0.17	0.02	0.20

Source: literature Consultation "AGRONICA" – 2005 by Do A&FD (GoO)

Impacts:

- Nutrient deficiency in soils may affect the plant growth and Crop productivity.
- Persistent nutrient depletion due to intensive cropping is known to have posed a great threat to soils of Odisha, as assessed from other completed irrigation projects.

Mitigation Measures:

- Integrated Nutrient Management (INM) method has been adopted to restore soil health and ensure Environmental compatibility.

I. INM Method for Nutrient Supply

- The important components of integrated nutrient supply system comprises of application of chemical fertilizers combined with organic manures, green manuring and bio–fertilizers at a rationalized proportion according to the nature and extent of soil deficiency.
- Although Chemical fertilizers are the most important components of INM, it should be used judiciously to minimize their deleterious effect on soil health. A large part of the chemical fertilizers should be replaced by bio–fertilizers / organics.
- Use of organics i.e. FYM and compost etc. prove to be very effective and agronomists have recommended this practise of nutrient replacement.

II. Maintaining Soil pH Ranges for Crops

- It is important to determine the soil pH, considered as a vital chemical property of soils of the command area (Before Project) at the baseline conditions.
- Amongst several Physical and Physico-chemical properties of soil, pH tests have been conducted in the command area to determine the nutrient

supplying capacity of soils. The optimum pH range in which a crop can be raised is presented in the table below.

Box No. 12: Optimum Soil pH ranges for Crops

Crop	pH ranges	Crop	pH range
Rice	5.0 to 6.5	Potato	4.8 to 5.6
Wheat	5.5 to 7.5	Tomato	5.5 to 7.5
Ground Nut	5.5 to 7.0	Cabbage	6.0 to 7.5
Maize	5.5 to 7.5	Sugar Cane	6.0 to 8.0

Source: AGRONICA by Directorate of Agriculture & Food Production

Soil Amendment:

However some liming materials like ground Lime stone ($CaCO_3$) and Quicklime (CaO) may be applied to the area showing slight soil acidity.

III. Application of Fertilizers:

In general application of chemical fertilizers is recommended for boosting up the crop production. The type of fertilizers quantity and method of application will be determined by the agricultural experts who will be associated with the farming community. The key input for determining the above fertilizer specifications is the "Soil Quality Tests" to be conducted at different locations.

Suitability of some common fertilizers used in the study area is highlighted below.

a) Nitrogen Fertilizers (Supplementing Nitrogen)

- Ammonium Sulphate Nitrate – Can be used for all kinds of soils. More useful for wet–land paddy.
- Urea – Effectively used for Rice to avoid runoff loss.

b) Phospheric Fertilizers (P_2O_5)

- Super Phosphate – Granular concentrated Phosphatic fertilizers suitable for all neutral soils.
- Mussoriphos (Rock Phosphate) – Dark / Block in colour mostly suitable for acid soils and for perennial crops.

c) Potassium Fertilizers (K_2O)

- Potassium Chloride – Suitable for all type of Soils.

- Potassium Sulphate – Suitable for all Crops and all soil types.

d) NPK Fertilizers

- Sulphala (15:15:15) – Suitable for most of the crops except for paddy.
- Gromor (28:28:0) - Suitable for all Soils and Most Soils as Basal application.
- Ammonium Phosphate NPK (14:35:14) – Suitable for most crops and all type of soils as basals. Most agreeable to pulses and oil seeds.
- IFFCO/ NPK (10:26:26) - do -
- Vijaya (24:24:0) - do -

IV. Application of Organic Manures :

- Organic manures are derived from plant, animals and human residues which release nutrients after their decomposition.
- Organic manures effectively promote the microbial activity in soils and improve its water holding capacity and in turn enhance soil capability.
- Concentrated organic manures have higher nutrient content. These are of the type "Oil Cakes" "Blood Meal" "Bone Meal" etc.
- Modern methods of composting have been developed by using waste decomposing microbes

V. Applications of Bio–fertilizers:

- Use of Bio-fertilizers is one of the important components of integrated Nutrient Management (INM). These Bio-fertilizers evolve micro-organism to convert inert Nitrogen gas from atmosphere in to proteins and amides which can be easily available to the plant.
- Green manures as renewable sources of plant nutrients have a biological origin and can be directly used on soils for improving soil fertility
- A zolla Bio-fertilizers technology is mostly recommended for irrigated agriculture as because this aquatic fern can be effectively used for Nitrogen fixing and accumulation of Soil nutrients.

Recommendations:

In the operation phrase of this irrigation project, following activities should be prioritized for maintaining a good soil health condition.

- Ensure conducting soil quality tests before taking up any specific crop cultivation.

- Adopt integrated Nutrient Management technology for supplementing soil nutrients.
- Appropriate doses of chemical fertilizers green manures and bio−fertilizers etc. should be decided in consultation with agricultural experts (DAO of the district)
- Ensure withdrawal of excess recharge from the farm land to avoid water-logging and soil salinity.
- Ensure farmers training and dissemination of knowledge for improving soil quality and farming management.

5.1.4.3 Impact on Water Quality:

[A] Surface / Water Pollution:

Increasing human activities, in absence of stringent environmental pollution control, would contribute to steady deterioration of water quality in the existing water bodies within the command area. Some of those common activities which may contribute to water pollution are mentioned below.

i. Due to flow of residues of Agrochemicals:

It is natural that farming community may be tempted to use excess doses of chemical fertilizers and pesticides with an objective to get extra crop yield in the irrigated agriculture. Such instances may occur even if they are advised/trained favouring integrated nutrient management and integrated pest management methods.

Due to land drainage/runoff from field, the residual fertilizers and pesticides from the crop land may drain in to local water bodies like streams, nallahs and ponds etc. and would affect their water quality adversely. The impact may be moderate to serve according to quantities used and effectiveness of land drainage. Severity may be experienced by the downstream users who may resort to domestic use of water as well as by the aquatic communities downstream.

Large water bodies like lakes and reservoirs of some small irrigation projects located at the downstream will develop eutrophication when confluenced by those streams carrying excess nutrients from the agriculture fields. Eutrophication criteria may lead to excessive algal growth, including obnoxious growth of blue−green algae; an irreversible and undesirable impact.

Proposed (Control) Measure against excess use of fertilizers:

Govt. of India promulgated fertilizers control order 1957 (FCO 1957) and later revised during 1985, called Fertilizers (Control) order 1985. Enforcement of FCO comprises of inspections, search, seizure and getting samples analysed by fertilizers Inspectors. The State Level agriculture extension officers of the locality may seek association of the fertilizers Inspector and restrict supply of fertilizers to the farmers i.e. excess supply other than the prescribed quantities should be prevented and fertilizers application duly inspected.

ii. Due to release of industrial effluents:

Due to intensive agriculture some small scale industries may develop in and around the command area villages. These industries may unscrupulously release the industrial effluents to the nearby water bodies.

According to water (Control & Prevention) Act, such direct release of effluents to water bodies should be prevented.

Mitigation Measures

- Water quality of the existing water bodies should be monitored at regular intervals.
- Water quality standards with reference to baseline assessment should be maintained.
- Water for domestic uses should be treated property and disinfected before human or cattle feed use.
- Removal of aquatic weeds should be ensured at periodic interval.
- An inventory of monitored water quality should be maintained and such records shall be reviewed by the environmental management committee.

Water Pollution during Operation Period

Sl. No.	Activity	Impact	Proposed mitigation measures
1	Cleaning of plants seeds and roots etc in local water bodies	- May construction water with residual toxic pesticides & agrochemicals - Unsuitable for domestic cattle folk use	- Cleaning of plants and roots should be prevented in any pond/water body - Ensure that such activities are carried out by farmers in

			fabricated Tanks
2	Garbage's from a social –cultural function may be dumped in to a water body	Water gets polluted through decomposition process and renders unpalatable	Village level committees shall be educated against severity of such unscrupulous use of wastes.
3	Leading of field drains directly to major water bodies	May early residual of toxic chemicals used for crop cultivation	- Field drains should lead to catch drains where it may be normally treated before being released to water body. - Conduct periodic water quality tests to ensure minimum of pollution impact.
4	Release of Industries effluents	Same local small scale industries may grow up as result of agricultural development effluents may be released to the nearest water body	DoWR should ensure that no effluents either from domestic or Industrial source should be led to the canals.

5.1.4.4 Impact Due to Growth of Aquatic Weeds:

Irrigation Canals and Drainage channels inside the command area are likely to be infested in course of time, with aquatic weeds which may be submerged and floating type.

Formation of weeds in canals, increase water losses by higher evapotranspiration and reduces the flow velocity of canals thereby reduces their carrying capacity.

Weeds in drainage ditches may improve the habitats of vectors for water borne diseases and mosquito vectors.

- Weeding in drainage channels are attributed to abundance of nutrients provided by increased use of agro-chemicals which find their way to stagnant or slow moving water bodies.

  Weeds in drainage channels not only block the free flow of water but also it makes the drainage network ineffective and become responsible for flooding the area during a high rainfall precipitation.
- Decomposition of weeds may affect the Dissolved Oxygen (DO) levels in the water body and become unsuitable for sustenance of fish species.

Mitigation Measures:

- Aquatic weeds can be controlled by three methods, i.e. mechanical, Manual or Biological control measures. Normally more than one technique is used concurrently for effective control. These weed control measures are discussed in the weed management plan in chapter-7.
- Ensure periodic removal of aquatic weeds from canals, minors and water courses as well as removal of undesirable vegetation growth on canal banks, in the following manner.
  - Removal of weeds from water courses should be carried out by manual dredging at regular intervals. These weeding activities shall be carried out during the canal closure period i.e. after Khariff water supply and after Rabi water supply.
  - Vegetations on the canal banks / water courses may be removed either by mechanical means (Mowing) or by manual method.
  - Weeding activities should be undertaken through Pani Panchayats involving members of the particular water courses feeding to their farming areas. This should be cost economic.
  - The removed weeds from water courses may be best used for bio-gas generation or for composting at site.
  - For removal of weeds from ponds and tanks, biological control measures are recommended. For example, Chinese grass carp (Fish Species) may be introduced which feed on the aquatic weeds of still water bodies.

5.1.4.5 Impact on Command Area Due To Water Logging:

Introduction of irrigated agriculture in the command area means adequate supply of irrigation water on the crop area for a longer period. For this adequate surface and sub-surface drainage must be provided to ensure that water and salt balances can be maintained on a long term basis. Taking into consideration the elevated levels of ground water recharge at a particular area (Mostly low lying areas), the critical water logging phenomenon may appear whose impact is grossly detrimental to crop health.

Development of water logging conditions in the Command area has been discussed in Chapter 3.

From the baseline assessment regarding ground water level study of command area & field data already furnished in Para 3.8.5 Chapter 3 of this documents it

may be concluded that most areas prone to water logging are existed in Jajpur district.

Mitigation Measures:

- Post project monitoring should be carried out every year.
- Conjunctive use of Ground Water: Survey & field details for upland irrigation to be undertaken by Directorate of Ground Water Survey and Investigation GWS&I under DoWR according to administrative decision. Detailed study has to be carried out by GWS&I and a suitable implementation plan be suggested.
- Ensure depletion of ground water table/ release of excess recharge by pumping. The pumped water may either be supplied for upland irrigation may be utilized by industries or otherwise
- Reduction of canal flow in support of optimization of irrigation water supply.
- Provide adequate field drains in the water logged command area.

However, management methods of water logging are further elaborated in the management plan at Para 7.8 Chapter 7.

5.1.4.6 Impact on Public Health:

- This irrigation project at its operation phase will contribute to increase in the water fringe area which in turn would provide suitable habitats for growth of various disease vectors.
- It would lead to increased incidence of water related diseases in the command area villages.
- Malaria is endemic in the study area as revealed during the baseline assessment. The preferred habitats for mosquito vectors are stagnant water pockets and slow moving water bodies existent in the command area.
- Formation of weeds in the comparatively slow moving drains become the safe habitat for mosquito vectors and other disease vectors.
- The main breeding seasons of the Anopheline mosquito vectors are spread from the month of October to March.

Impact:

- Prevalence of waterborne diseases in the command area greatly influences the physical and mental wellbeing of the people and reduces the work efficiency considerably.
- People may suffer from anaemia due to malnutrition, gastroenteritis, dysentery, diarrhoea and other entric diseases due to the polluted water quality.

- Worm infection causes anaemia mostly observed in women and children folk of the rural area who walk barefooted.
- Other common diseases are respiratory tract infections caused due to burning of bio mass and existent unhealthy social environment.
- Most areas in the proposed command are known to be Malaria prone. But due to the lack of early diagnosis and knowledge on the curative measures, the malaria eradication programme has not been fully successful although mortality rate has been considerably reduced by now.

Existing Health Care Infrastructure:

The National Health Policy 2002 reaffirms to provide prophylactic and curative health care services and aims at achieving acceptable standards of good health for all people by increasing their awareness and access to the public health system. In this regard the states have provided decentralised health care services for quick benefit to the people.

In instant Case, the health care infrastructures available in the study area in different blocks of three districts are shown below.

Table No. C5-13: Existing Health Care Infrastructure (Allopathic)

Sl. No.	Districts	Blocks	Govt. Hospitals	Community Health Centres	PHCs & others	Sub Centres	Private Hospitals & Nursing Homes
1	Dhenkanal	Bhuban	1 (NAC)	3	4	15	X
		Kankadahada	2	1	2	16	X
2	Jajpur	Danagadi	X	X	4	17	X
		Korei	X	1	6	22	X
		Rasulpur	X	1	5	27	X
		Sukinda	X	1	4	21	X
		Vysanager	1 (ULB)	---	---	---	----
		Jajpur	1 (ULB)	----	---	---	---
		Anandpur	X	X	7	19	X
3	Keonjhar	Ghasipura	1	1	8	23	
		Anandpur	1	X	X	X	

Source: District Statistically Hand Book 2009–10

Apart from the above; there are some Homeopathic and Ayurvedic Health Care units existent in these blocks.

These health care units are well staffed and equipped to provide treatments and render health care advices to the people of the area.

Malaria being endemic in these areas, malaria control measures have been prioritized in these hospitals and PHCs. It provides facilities like early testing of

blood samples, detection of malaria and supply of preventive medicines other than normal responsibilities of extending treatment facilities. In the past decade till 2010, the statistical review, district-wise, reveal that the curative instances have increased and mortality rates decreased.

Table No. C5-14: Malaria Control Achievement

Districts	Malaria Cases detected	Cases cured	Percentage Cured	Deaths due to Malaria
Dhenkanal	10938	10932	99.9%	6
Jajpur	3529	3529	100%	Nil
Keonjhar	35290	35270	99.95%	16

Source: District Statistical Hand book 2009 -10

The death rate in Keonjhar district attributes to ignorance, financial inability, apathy and lack of access to medical service by largely occupied tribal population. The state of Odisha has adhered to centrally sponsored programmes like National Rural Health Mission (NRHM) mandated to provide effective health care to the rural population, especially women and children. Such benefits will be extended to the various blocks under these three districts.

Malaria Mitigation Measures (MMM)

Malaria mitigation measures have been implemented successfully for the completed phase of LBC-II Phase-I which is undertaken by Department of Health (DoH) in association with project personnel of Department of Water Resources (DoWR). The activities involved in the MMM plan are.

- ✓ Early diagnosis of Malaria and prompt treatment.
- ✓ Integrated vector control measures.
- ✓ Training and Capacity building.
- ✓ Information, Education and communication for Anti-malaria Campaign.
- ✓ Engineering methods for destructing of habitats of mosquito vectors in the command area.
- ✓ Funding for implementation of MMM.
- ✓ Monitoring Activities.

The monitored data and evaluation report concerning the Malaria Mitigation Measures activities under LBC-II Phase-I already scripted in the Annual Report

prepared by Consultants Nippon Koei (Japan) and WAPCOS Ltd. will be referred to while preparing the Health Delivery Plan for the next phase i.e. LBC-II Phase-II. The proposed Health Delivery Plan is discussed in detail in the Para7.9.1 of Chapter 7.

5.1.4.7 Impact due to the Global Warming and Climate Change:

Global warming and its consequent effect on climate change propagate a gloomy picture on the survival of human beings and other forms of Biodiversity on the earth. It has thus become an important agenda of the international community to curb the excess carbon emissions grossly responsible for global warming. Climate change is occurring due to the increase in the level of Green House Gas [GHG]. The main contributors to GHG are Carbon Dioxide, Methane, Nitrous Oxide and some fluorinated gases. Environmental scientists have revealed that the excess warming of the planet is closely linked with the built-up in the atmospheric concentrations the above mentioned gases, mostly originated from burning of fossil fuels, land use and agriculture.

1. Impact due to Greenhouse gas emission from machineries during construction stage:

The Rengali Irrigation Sub-Project LBC-II Phase-II is a canal construction project which will involve various activities like Transportation of material, excavation of earth construction of canal bund, tunneling, construction of culverts, elephant passages, road crossing etc. For carrying out these activities number of on-road transportation vehicles as well as number of off-road construction equipments would be used. Such vehicles / gasoline /diesel equipment would use fossil fuels, combustion of which will generate green house goes like CO_2. For Projecting emission of greenhouse going to the atmosphere the following three approaches can be utilized.

- Type and Amount of fuel used and the respective fuel emission factor.
- Type of equipment and the emission from each type of equipment per hour and the number of hours the equipment is in operation.
- The volume of material to be transported or handled by the equipment and specific energy needed for such quantity

For this project the second method i.e. Type of equipment/vehicle and emission from each type has been taken as the basis the CO_2 gas emission for various on-road vehicle and off-road construction equipments are given.

Table No. C3-15: CO_2 emission from various types of on-road vehicles

Sl. No.	Type of vehicle	CO_2 emission in kg per 100 mile of run	CO_2 emission in kg, per 100 km of road.
1	Conventional gasoline car	36	22
2	Conventional light duly gasoline truck	47	29
3	Conventional medium duly gasoline truck	147	90
4	Conventional heavy duty gasoline truck	29	18
5	Conventional Diesel car	39	24
6	Conventional light duly diesel truck	88	54
7	Conventional medium duly diesel truck	78	48
8	Conventional heavy duty diesel truck	103	63

Table No. C3-16: CO_2 emission from various off-road construction equipment kg/100 hours of run

Equipment type	Most common engine/fuel type	Kg CO_2
Air compressors	Gas – 4 stroke	777
Bore/Drill rigs	Gas – 4 stroke	326
Crawler tractor	Diesel	27,030
Crushing/processing equipment	Gas – 4 stroke	935
Dumper/Trenchers	Gas – 4 stroke	467
Excavators	Diesel	5,774
Graders	Diesel	6,585
Off-Highway tractor	Diesel	27,030
Off-Highway trucks	Diesel	27,078
Other construction equipment	Diesel	10,190
Pavers	Diesel	3810
Paving equipment	Gas – 4 stroke	655
Plate compactors	Gas – 4 stroke	367
Pumps	Gas – 4 stroke	621
Rubber Tyred Dozers	Diesel	7,815
Rubber Tyred Loaders	Diesel	7,815
Scrapers	Diesel	12,412
Tractors /loaders	Diesel	1,342

Water trucks	Diesel	27,078
Welders	Diesel	619

Source:"Greenhouse gas mitigation measures for transportation, construction, maintenance and operation activities" Prepared by ICF International, 620, 7olson street, 2nd floor, San Francisco, USA on request from American Association of State Highways and Transportation officials standing committee on the Environment.

The construction activities will be going on at several spread areas, certain activities may be continuous/discontinuous depending on situation, facilities available and several other factors. Therefore it is not practical to calculate the absolute quantity of emission for the entire project activities in precise term.

MITIGATION MEASURES

1. Reducing Fuel Use or Improving Fuel Economy can help reduce green house gas emission. This can be possible through the following methods

- Reducing Idling:
  Unnecessary idling occurs when trucks wait for extended periods of time to load or unload; or when equipment that is not being used is left on reduced idling reduces fuel consumption and the associated green house gas emission.
- Equipment Maintenance:
  Proper maintenance often results in fuel savings, although the magnitude of savings varies by equipment type and condition. Maintenance may include systematic equipment inspection, detection of potential failure and prompt correction. For example improperly inflated tires and poor wheel alignment can adversely affect the fuel efficiency of a small truck by 3-4%. Under inflated tires increases the tires rolling resistance, require more fuel to move the vehicle.
- Driver Training:
  Training the drivers for efficiently operating the vehicle/construction equipment can same fuel.
- Properly sized Equipment:
  Identifying the proper size equipment for a task can also provide fuel savings and associated reduction in green house gas emission.
- Alternatives to Diesel Generators:

Diesel generators may consume as much fuel as a piece of construction equipment per hour and are generally operated over a longer period of time. Instead electrically powered equipments may be preferred as an alternative.

2. Impact on Agriculture

Studies reveal that climate change will adversely affect the agriculture and consequently the food security all over the world. According to findings of Indian Council of Agricultural Research (ICAR) in their Network Project on Climate Change (NPCC), the productivity of "Rice" may fall up to 6%, staple Grain Wheat by 18% by 2020 & Some Khariff Maize and Sorghum by 10% due to adverse impact on climate change; interalia raising of global average surface temperature every year.

Instances at National Scenario reveal that:

I. In 2002 drought has affected food production by 10% less.
II. Cold waves in 2003 hit cultivation of Mustard, Mango, Guava, Papaya, Brinjal, Tomato & Potato etc.
III. High rain fall in 1998 and 2005 affected Khariff and Late Khariff etc. resulting a rapid price hike.

Mitigation Measures:

To mitigate the impact of climate change, the Govt. of India has launched the National Action Plan on Climate Change 2008. In this plan it is stipulated to reduce the emission intensity by 20 to 25% between 2005 and 2020. The Govt. has also formed an expert group on low carbon strategy.

The Broad Mitigation Measures are

I. Ensure cut in emission of GHG and implement Carbon Capture Storage (CCS) method in fossil fuel plants.
II. Encourage production of clean energy like Nuclear, Hydropower etc. and Non-Conventional energy from Sun, Wind and Sea.
III. Fixing the Carbon Dioxide (CO_2) through large scale greenery development both by plantation and enhancement of crop area.

The first approach dovetails policy intervention at State and Central Govt. Level and is being considered as an extensively debated issue. The second remedial measures are eco-friendly and being encouraged by the energy sectors. But the third remedial measure i.e. extraction of CO_2 method attracts great importance to the country's development planning. Large scale expansion of greenery by way of extensive plantation and crop area enhancement strategy not only ensures extraction of CO_2 from atmosphere, but also contributes to higher production and food security.

Positive Impacts:

I. Increased Crop Area:
- By and large Rengali Irrigation Project clearly focuses on the enhancement of crop area through irrigated agriculture development of 2,18,392 ha of cultivable land in five districts of Odisha.
- LBC-II Phase-II alone will irrigate 72967 ha of CCA spread in three districts i.e. Dhenkanal, Keonjhar and Jajpur districts with a cropping intensity of 190%. Increased crop area distributed throughout the year will contribute adequately to Carbon Dioxide extraction concept.

II. Plantation:

The project envisages extensive plantation along the Canal Banks, few length of connecting approach roads and green belt plantation around the colony. There would be around 3,50,000 plants from selected species which will be planted with estimated cost at 0.78 million rupees. Increased greenery levels will not only assist carbon dioxide extraction process, but also contributes to enhanced ecologic status.

Negative Impacts:

One of the other attributes of global warming is production of methane. Methane emissions generally come from cultivation of rice, pipelines leaks and flatuence of cattle's and forest fires. Cultivation of rice in the wet season takes the priority option; there may be production of methane. But the adversity will be minimized due to the seasonal effect and increased areas of water bodies. However the cropping pattern selection in dry season will adequately address to the anticipated adversity.

5.2 POSITIVE ENVIRONMENTAL IMPACTS:

Based on the project details (Chapter 2) and Information / Data collected during Baseline study of Environmental Conditions (Chapter 3), potential impacts that are likely to result due to implementation of sub-project LBC-II Phase-II, have been identified both qualitatively and quantitatively wherever possible.

The negative impacts at various phases of implementation have been discussed in Para 5.1 of this document.

This paragraph deals with some positive impacts that add up to the benefit enumeration, the project envisaged at the planning stage.

Some of those positive impacts are identified under the following environmental issues.

I. Employment Opportunities
II. Food Security and diversified crop benefits
III. Economic benefits for better Social status
IV. Development of road communication
V. Meeting the water scarcity
VI. Up-liftment of ecology and environmental health

5.2.1 Employment Opportunities:

The project targets its completion by 2023-24 during which construction activities will be spread from RD 71.313 km of LBC located at Dhenkanal district to RD 141.00 km in Keonjhar district, the major portion being traversed in Jajpur district

i. District wise Employment status [Registered vrs Placement]

The status of employment as statistically recorded up to December 2009 is charted out in **Table No. C5-17** given below

Table No. C5-17: District wise Employment Status [By December 2009]

Sl. No.	Name of District	Particulars	Category wise educated persons (in Numbers)												Total by 2009
			Matric			Intimate			Graduate			Engineering Diploma Holders			
			W	SC	ST	W	SC	ST	W	SC	ST	W	SC	ST	
1.	Jajpur	• Total Registered • Total Placement • Total Live Register at the end of yr 2009	1121 * 3061	751 * 4037	221 * 1070	624 * 3485	354 * 4826	35 * 325	1087(G) * 2268	296(G) * 1332	33(G) * 152	40 * 138	28 * 79	04 * 27	4594 20800
2.	Dhenkanal	• Total Registered • Total Placement • Total Live Register at the end of yr 2009	1927 8 4645	711 6 1327	300 9 1062	1042 10 2202	325 8 832	130 6 282	797/00 7 1729	114/00 2 461	26/00 1 106	10 0 67	18 0 65	2 1 14	5402 58 12782
3.	Keonjhar	• Total Registered • Total Placement • Total Live Register at the end of yr 2009	783 1 2506	518 16 2833	742 9 9	563 2 1671	289 7 1178	437 4 1290	702/00 9 1460	192/00 2 708	215/00 2 714	58 2 314	18 3 129	23 7 140	4540 64 12952

Source: District Statistical Hand Book-2009 by Directorate of Economic & Statistics, Govt. Of Odisha

Notation Used

W: Women, SC: Scheduled Caste, ST: Scheduled Tribe, G: General, T: Technical, *: No information

Analysis:

- From the above table it is evident that the employment opportunities have either meagre or Nil.
- The status if updated as per Census 2011 by using 10% decadal growth rate does not make much difference. However there may be small incremental employment percentage due to increase of industries in Jajpur area.
- Educated Women persons are high in percentage. Their placement rate is not encouraging.

ii. Estimation of Labour Man days

Out of the estimated project cost of Rs 1958.34 crores the civil work component in 39 packages approximates 6838 million INR. It is contemplated that most of the civil works will be executed through mechanical means. The labour component @ 20% works out to be Rs 1367.6 million which implies that about 5.47 million labour days will be generated in 5 years' span of construction period.

iii. Employment as construction labours

Requirement of construction labourers averages 10,94,000 per year subject to phasing of expenditure. Besides some skilled category of labourers likely to be imported from outside, the huge requirement of labourers will be met out of the intending people from the adjacent locality.

Some engineering diploma holders civil, mechanical and electrical disciplines remaining unemployed may also find job placement during the construction period of this project.

Some literate generalists from the locality may also get engaged as laboratory analysts, supervisors record keepers and desk assistance. Unemployed women persons may get employments in the above discipline.

iv. Employment opportunity as agricultural workers

In the command area of LBC-II Phase-II covering eight Blocks in three districts, there were 110921 numbers of people assessed below poverty line. Most of them are landless. Their life sustenance is based on daily wage labour engagements. Although many of them are covered under several developments, the jobless persons under BPL category are still high (64.51 %).

An assessment made in this regard is furnished in Table below.

Block	BPL	SGSY	MNREGS	Total	Worker	Balance
Bhuban	10025	319/319	5238/954	5557	1273	4468
Kankadahad	12686	255/227	5819/2184	6074	2411	6612
Danagadi	11941	411/378	3802/615	4213	993	7728
Korei	14219	542/463	3923/315	4465	778	9744
Rasulpur	15274	657/569	8310/588	8967	1157	6307
Sukinda	11577	492/403	3325/882	3817	1285	7760
Anandapur	16099	389/344	2783/1203	3172	1547	12927
Ghasipura	19101	444/393	2643/720	3087	1113	16014

Table No. C5-18: Person under BPL category yet not covered by Development programmes (By Dec 2009)

Name of District	Name of Block	BPL category (No.s)	Covered under Development Programmes			Balance Not Covered (No.s)
			SGSY (No.s)	MNREGS (No.s)	Total (No.s)	
Dhenkanal	Bhuban	10025	319	5238	5557	4468
	Kankadahada	12685	255	5819	6074	6612
Jajpur	Danagadi	11941	411	3802	4213	7728
	Korei	14219	542	3923	4465	9744
	Rasulpur	15274	657	8310	8967	6307
	Sukinda	11577	492	3325	3817	7760
Keonjhar	Anadapur	16099	389	2783	3172	12927
	Ghasipura	19101	444	2643	3087	16014
	Total	**110921**	**-**	**-**	**39361**	**71560 (64.51 %)**

Source: District Statistical Hand Book, 2009

From the statement above it is assessed that about 64.51 % of persons remain jobless under BPL classified category. Taking in to consideration some of them have found engagements in other development programmes by now (2013); remaining large number of persons capable of physical labour may find engagements as agricultural labourers in the proposed irrigation project having wide scope of agro-based employments.

Some of them may adopt shared agriculture method attached to large land owners. In this way they not only fulfil their food requirement but also can earn a good living.

5.2.2 Food Security through Diversified Crop Benefits:

In the pre-project scenario, farmers of the Command area availed Khariff cultivation only under rainfed agriculture. Due to wide variation in rainfall

distribution the crop benefit becomes affected with much less production. After availing benefits of assured irrigation, there would be crop diversification according to a recommended cropping pattern. The farmers will get higher crop benefits from the irrigated agriculture.

5.2.3 Development of Road Communication:

Construction of left main canal LBC–II Phase-II will provide 70 km long canal bank service road duly black topped for all weather use. This will link to some existing village roads and district roads of the command area and establish shortest linkage from Dhenkanal district up to Anandpur block of Keonjhar district.

Apart from the main canal roads, the Branch canals and Distributaries will also have 5 mt (About 16 ft) wide canal bank service roads which being spread throughout the command area will provide additional communication facilities. The farmers will avail better transport facilities for crop carriage and crop trading.

Better communication facilities being the Index of improved social status, the command area will effectively provide the socio-cultural input to the region.

5.2.4 Meeting the Water Scarcity:

Although the command area is covered with network of streams and drains, most of them carry seasonal flow being non-perennial in nature. They gradually dry up after November; thereby posing problems of water scarcity for domestic use and water use by cattle folk, etc. Their requirement will be reasonably met by the canal water supply. Since the water quality confirms to use based classification under 'C' category. It can be used for bathing and other domestic purpose after imparting treatment and disinfection.

Some sizeable tanks in the command area engaged for pisciculture activities may require supplementation of water during the period of water scarcity. They may approach the water resources authorities for allocating water for developing pisciculture.

5.2.5 Up-liftment of Ecology and Environment:

The project authorities propose to implement extensive plantation approach in the project area. It includes areas as follows,

- Canal bank plantation
- Approach road/Avenue plantation
- Green belt plantation around colony open spaces plantation methods have been discussed in Chapter 7.

5.2.6 Crop Benefit in LBC-II Phase-II [Ayacut 72,967 ha]:

A Comparative study has been conducted between the agricultural crop productions in the pre-project rain fed cultivation with the projected crop production after irrigation. The projected cropping pattern for irrigated agriculture is recently recommended by the Dy. Dir. Agriculture Jajpur in his report dated 28th Jan 2014 which supersedes the contention in the DPR. [Copy furnished in **Annexure No. XI**]

The cropping pattern, now considered for the sub-project LBC-II Phase-II is furnished below.

Table No. C5-19: Crop Budget farm procedure & receipt (before project & after project)

Status	Season	Crops	Area (Ha)	Yield Rate (Qnty/Ha)	Farm Produce (Qty)	Market Rate (Rs. /Qty) (yr 2013-14)	Farm Receipt (Rs. In lakhs)	Remarks
Before Project rainfed Agriculture	Kharif	Paddy Early paddy Medium Paddy Pulses Vegetables	13864 15052 5941 3961 792	20 20 20 04 50	2,77,280 3,01,040 1,18,820 15,844 39600	1400 1400 1400 5000 2500	3881.92 4214.56 1663.48 792.00 990.00	Annexure No. XI
Sub Total Rain fed Kharif			**39610 Ha**	**-**	**752584 say 75258 tons**		**11,541.96 say 11542**	
After project Irrigated Agriculture	i. Khariff	Paddy Early paddy Medium Paddy Pulses Vegetables	6990 11184 9786 11650 4660	35 35 35 08 200	244650 391440 342510 93200 932000	1400 1400 1400 3000 2000	3425 5480 4795 2796 18640	
	Sub total Kharif		44270	-	2003800 say 200380 tons	-	35136.00	
	ii. Rabi	Paddy Early Paddy Vegetable Ground nut Patato Pulses	11557 7083 4660 9320 4660 4660	40 40 220 20 300 8.5	462280 283320 1025200 186400 1398000 39610	1400 1400 2000 6000 2000 3000	6472 3966 20504 11184 27960 01188	
	Sub Total Rabi		41940	-	3394810 say 339481 tons	-	71274.00	
	iii. Perennial -		2330	-	-	-	-	Not Assessed
Grand Total (Post Irrigation)			**88540**		**539861**		**106410**	

*Note: As per Cropping pattern/Crop Budget recommended by Dy. Director Agriculture, Jajpur (January 2014).

Source - Cost Estimate 2014/DoWR

Economic Analysis (Financial):

Net product value for each seasonal crop has been estimated at the prevailing price year (2014) and cost of farm produce worked out for both pre−project crops and post project (After Irrigation) crops, the latter being regulated by a well planned cropping pattern.

The incremental financial benefit includes crop benefit from cultivation of seasonal crops along with benefits accrued from agricultural by products. Such detailed calculations are furnished in **Annexure No. XI**.

Summary of annual net incremental benefit (Financial) after Irrigation is shown below.

Table No. C5-20: Crop Benefit Comparison between before project (Before Irrigation) and Post project (After Irrigation) Scenario

Sl. No.	Status	Season	Crop Area (Ha)	Farm Produce (Tonnes)	Farm Receipt Amount Million in INR	Remarks
1.	Before Project Rainfed Agriculture	Khariff (Rainfed)	39610	75258	1154.20	As assessed by Dy. Dir. Agriculture
2.	After Project (Irrigated Agriculture)	Khariff Rabi Perennial (5%)	44290 41940 2330	5,39,861	106410.00	• Projected scenario according to cropping pattern recommended by Dy. Dir. Agriculture Jajpur, Jan 2014 • Perennial Crop not assessed
3.	Benefit (Row 2-1)		88540 Ha	4,64,603 tons Say 464.60 T. M Tons	9486.80 Million INR Say 9487 Million INR	Receipt amount likely to be enhanced due to increasing trend of market price

Analysis:

- The incremental crop benefit of 464.60 T. MTons will entail financial benefit of Rs.948.7 Crores. Benefit due to agricultural by-product will be additional.
- The incremental financial benefit due to irrigation calculated in the year 2014 may further increase during the operation phase depending upon field requirements.
- The cropping pattern adopted for crop accounting purpose may undergo change according to the field requirements, best suited for the region. The District Agriculture Officer (DAO) while considering future revision may consider to include some more cash crops for higher financial benefit.

However, the projected income enhancement from irrigated agriculture will provide better life sustenance of 45604 numbers of command area people with their socio-cultural status up-liftments.

5.2.7 LANDSCAPE:

Sustainable development integrates higher level of Socio-economic achievements as well as Environmental quality in a balanced manner. The healthy Environment is indexed with aesthetics of the surroundings.

In the process, the project construction entertains transformation of Nature by manmade activity which induces change in land use inter-alia the landscape.

5.2.7.1 Environmental Aesthetics of LBC-II Phase-I:

During the brief review of the completed phase of Rengali Left Bank Canal (Phase-I – up to 71.313 km) the change in land use i.e. the conversion of various category of land into a water body comprising of well-designed canal section propagates a scenic appearance of the landscape.

Impact: The construction of Canal has impacted the terrestrial flora to some extent by felling down / removal of some common species of flora.

Mitigation Measures: During the construction period canal bank plantations at both sides of canal have been undertaken in a systematic manner which not only responds to Bio-diversity compliance but also enhances the scenic beauty. It may be broadly considered as a positive impact.

A comparative view of the pre-project landscape and after completion status is furnished in Plate No. C5-1 and Plate No. C5-2.

Plate No. 5.1: Landscape showing Pre-project view of landscape showing proposed alignment of LBC-II Phase-I







Plate No. 5.2 Landscape showing after completion view of the LBC-II Phase-I







5.2.7.2 Environmental Aesthetics for LBC-II Phase-II

The proposed phase of this irrigation project includes construction of main canal from RD 71.313 km to 141.00 km for about a length of 70 km along with its distribution network comprising of Branch canals, distributaries, minors and sub minors to cover an ayacut of 72,967 ha.

But the main canal, taken in a strip of about 100m width is presently considered for assessment of environmental aesthetics.

The construction of main canal may have a significant impact on terrestrial flora when it involves felling of trees and their subsequent removal. For the purpose of assessment, the work is spilt into seven segments in the reach from 71.313 km to 141.00 km.

In the commencing segment from 70 km to 80 km the canal passes through the southern boundary of Birasal Forest range. However the main canal is cautiously aligned such that it encounters the forest range with degraded type of forest floras which are common species and are available in the adjacent forest range.

During preliminary survey, the project authorities have enumerated the trees to be felled along the alignment.

Sl. No.	Location	Segment	No. of trees to be felled
1.	From RD 71.313 km to 100.49 km	1 & 2	1568
2.	From RD 100.49 to 141.00 km	3 & 7	543
		Total	2111

According to the prevailing guidelines of Forest Rules, the project authorities will compensate the loss of forest land and felling / removal of trees by compensatory afforestation where in larger number of trees of similar species is proposed to be planted in the a joining non−forest land.

In addition, canal bank plantation will be taken at both sides of the canal at 5.0 m spacing in two rows. In this manner, about 330400 no.s of trees of selected species will be planted which will enhance the environmental aesthetics.

5.2.7.3 Contributory Aspects of Projected Landscape:

I. Well designed canal section with inner slopes decently lined.
II. Flowing water mass in Canal.
III. Turfed leeward slopes.
IV. Black topped/ moorum topped (WBM) service roads.
V. Abundant greenery contributed by Canal Bank plantation.
VI. Canal crossing structures for the benefit of local human population as well as wild animals (Elephants)
VII. Barren land to be converted to agricultural land



5.2.8 SOCIAL IMPACT ASSESSMENT:

This Rengali irrigation sub-project LBC-II Phase-II will have lot of positive impacts on the socio-economic environment of the project area. Some of them are mentioned as below.

- Productivity of land will be increased.
- Double or multiple crops will be possible due to irrigation.
- Diversification of agriculture particularly raising of cash crops may be possible.
- Generate better employment potential in agriculture.
- Income of local people will increase.
- Application of modern methods of agriculture would be possible.
- People working in crop land would be benefited.

A sample Socio-economic survey has been conducted in 15 villages covering all (137) displaced families (DFs) and in 10 villages for 209 affected families (AFs) of LBC-II, Phase–II of Rengali Irrigation project in Dhenkanal, Jajpur and Keonjhor district in consonance with the Government of Odisha for Resettlement and Rehabilitation Policy, 2006. Some important findings of the study are dealt briefly hereunder.

i) Impact on Social Institutions:

There are good numbers of social institutions in the area like a) Self Help Groups (SHG) b) Community Based Organisation (CBOs) c) Village Committees d) Pani panchayats e) Non-Governmental Organisation (NGOs)

These social institutions work for the better economic structure of the villagers. The irrigation project will variously affect the scope of work of the institutions as with the diversification of agriculture and stable agriculture activity, there will be assured enhanced yield of crops. The SHGs will concentrate more on producing agricultural products than on forest based products. The NGOs will devote more time for imparting training to farmers on improved and scientific methods of cultivation as well as on proper methods of application of fertilizers and pesticides etc. The cultivable land having increased activities due to irrigation, the scope of pani-panchayat would increase. The village level committee would also look in to the road communication on the canal bank, its proper maintenance and canal bank plantation.

ii) Impact on Existing Infrastructure and services:

- The canal alignment would have practically no effect on social infrastructures in the study area.
- The baseline study indicates that the existing social infrastructure facilities in the area need improvement through government support.

Road Connectivity

In recent years there have been a lot of improvements in the road connectivity of the area. Further development is taking place through PMGSY (Pradhan Mantri Gram Sadak Yojana). This helped villagers to avail better communication facilities. Implementation of this canal subproject will improve the road connectively programme immensely. Canal bank service road, of about 900 kms will be newly created which will connect the existing village roads in 570 villages.

Impact on socially vulnerable groups:

- Socially vulnerable group constitute Scheduled Caste (SC) and Scheduled Tribe (ST) population.
- Incidence of poverty is most pronounced in the SC and ST sections of the society.
- Despite dedicated efforts for upliftment of socio-economic status of these vulnerable groups, achievements through various welfare schemes and government sponsored programmes remains below the target.
- In the study area, there are 25 nos of homogenous village having more than 90% tribal population. Scheduled Caste (SC) population is significantly high in most other villages.
- Since this irrigation project will not induce large scale displacement or resettlement issue there would be least adverse impact on this ethnic group. Agriculture being their mainstay for livelihood; about 70% from these vulnerable group will reap the benefit of irrigated agriculture.
- The central Government continues to promote various welfare schemes and development programmes like schedule caste sub plan (SCSP) and Tribal sub plan (TSP) for which adequate funds are allocated in the 12th five years plan. Further to the above the state Government is more emphatic in tribal development through many other welfare schemes.

Socially and Economically Backward classes:

They constitute mostly the category of people who are classified as poor. They belong to Below Poverty line (BPL) category. BPL is an economic bench mark and poverty threshold used by the Govt. of India to identify economically disadvantaged people whose sustenance is programmed through various

government schemes. While the state government continues to assist the BPL category, the socio-economic condition of such people would gradually improve due to this project and their numbers may get reduce in future.

Impact due to Misdistribution of Benefit and damage:

The command area development planning will be suitably made such that the benefits of irrigation would rationally reach the beneficiaries. The present project covers a vast area of 72,967 hectares of land where irrigation facilities will cover many villages of tribal and scheduled caste dominated areas. Misdistribution of benefits are not foreseen.

There will be no damage to the social environment except for the fact that there would be very little involuntary displacement without need for resettlement. Various facilities will be provided to displaced community, mostly squatters, according to the state R&R Policy. The affected people will be suitably compensated as per the provisions of LA Act.

Historical and Cultural Heritage

In the baseline study in Chapter-3 of this EIA report, the list of sites and monuments of historical and cultural heritage has been mentioned. It is found that none of the sites of historical and cultural heritage of importance will be affected within the study area.

Local conflict of Interest

Even with the stipulated diversified benefits achievable by this irrigation project local people / beneficiaries may face some conflict of interests during both constructions and operational phase during implementation.

Few Such notable issues are;

- Conflict during land acquisition process involving local land owners & squatters
- Conflict between imported labour force, and host population during construction phase;

The Government of Odisha is committed to resolve those issues through implementation of its R&R and other related policy provisions. During the Stake Holders Meetings people have expressed urgent intentions for quick implementation of subproject LBC-II-Phase-II which indicates that they will positively address any conflict that may arise during implementation.

Impact on Sanitation

This irrigation project will not have any impact on the sanitation practices of the locality. Availability of irrigation would boost family income through intensive cropping and increased employment which in turn will support improvement of sanitary standards of the local people. The project authorities will also motivate people through Non Government Organizations to maintain drinking water quality and adhere to clean and hygienic sanitation mechanism.

5.3 Anticipated Impact Due to Heavy Metals in Sediments & Mitigation Measures:

General Impact:

- Pollution of the aquatic environment by organic and inorganic chemicals is a factor which poses serious threat to the survival of aquatic organism including fish.

- Metal ions can be incorporated into food chains and concentrated in aquatic organism to a level that affects their physiological stage. Of the effective pollutants are the heavy metals which have drastic environmental impact on all organisms. Trace elements such as Zn, Cu, Fe, Ni & Mn play a bio-chemical role in the life process of all aquatic plant and animals and therefore they are essential in aquatic environment in trace amounts, while many other metals such as Cd, Cr, Pb and Co have no known physiological activities.

- Metals are non degradable and can accumulate in the human body system causing damage to nervous system and internal organs. In fact the higher concentration of heavy metals enter the food chain through aquatic system and get accumulated in places and animals in various tropic levels and may cause serious damage.

Specific Impact of some Heavy metals:

There are good numbers of heavy metals which can affect the environment beyond certain concentration limits in water / sediments. However, impact of some of the metals which are likely contaminants in river system in view of upstream industrial projects and irrigation activity are mentioned below;

Iron (Fe):

The metal is quite harmful to aquatic life, as evidenced by laboratory studies but in nature the degree of toxicity may be lessened by the interaction of the iron with other constituents of water. Should the metal be converted to an insoluble form then the iron deposits will interfere with fish food and with spawning.

Lead (Pb):

It is toxic cumulative poison. It accumulates in body tissues and therefore is very harmful for human beings. It enters the food chain through aquatic life and also through plants.

Nickel (Ni):

This is another metallic element which is of moderate concern because of possible carcinogenicity as far as humans are concerned; it also has variable harmful effects on aquatic life. It is toxic to plant life too and is a hazard to fish.

Mercury (Hg):

It is very toxic, especially in organo-mercury compounds. The hazards of mercury are magnified by the accumulation of organo-mercury compounds in fish. These has been some major pollution incidents (notably in Japan) where both death & severe damage to health has been caused to many people consuming fish and shellfish contaminated by heavy industrial discharges of mercury.

Zinc (Zn):

Zinc is essential to man but if ingested in gross amounts it has an emetic effect. However, the concern in water supply arises in regard to taste not toxicity and quite high level is permissible. In fishery water however, in contrast, the toxic action is much more important. The toxicity of Zinc to aquatic life is dependent on the hardness of water; it decreases with rising hardness.

Copper (Cu):

It is not particularly toxic to humans. It is used as an algaecide. Unless used with great care for algal control there is grave risk of fish kills, as it is a toxicant to the fish that copper is of greatest interest. It is an element the toxicity of which to fish varies widely with hardness of water.

Chromium (Cr):

It is toxic to a degree which varies with form in which it occurs whether as trivalent Cr^{+3} or hexavalent Cr^{+6}. The later is considered carcinogenic to humans beyond certain limits. The deaths of livestock resulting from watering in Chromium contaminated water have been reported from time to time.

Cadmium (Cd):

The metal is very strongly absorbed in mud, humus and organic matter leading to the possibility of entry to food chain via fish and fish food and subsequent accumulation in tissue. The principal physiological effects of Cadmium are bone damage, chronic kidney disease, cancer and hypertension. The metal is also highly toxic to aquatic life.

Specific Impact for LBC-II Phase-II:

- The study reveals that the present heavy metal pollution in River Brahmani near Samal Barrage is comparatively less (Compared to Mahanadi & Baitarani Rivers).
- The result showing seasonal variations may have almost insignificant impact on irrigated agriculture as because industrial effluent may have been diluted during the travelling distance.
- Apparently, trace elements discharged into the river system tend to be short lived in the water column, rapidly settling out as bottom sediments.
- The bed load transport may occur during the Monsoon season.
- Sediment pollution may be distributed / dispersed during the long traverse.

Mitigation Measures:

To minimize the level of pollution from industrial effluents and drainage from agricultural crop land and sewages in the river water to a sustainable level the following mitigation measures are suggested.

- Industries located by the side of River Brahmani upstream of Samal Barrage would be advised through appropriate statutory authority not to discharge untreated industrial effluents to the river. The same should be strictly enforced. Only effluents meeting the stipulated standards should be allowed.
- In order to restrict heavy metals from pesticides integrated pest management control would be practiced. The farmers would be given proper training for application of pesticides.

- Integrated Nutrient Management approach would be utilized for application of fertilizers after proper analysis of soil characteristics so as to avoid residual chemicals in the drainage from crop land.
- Sewage from townships would be treated before discharge to river system. However, sewage discharge into river should be avoided.

CHAPTER - 6
ANALYSIS OF ALTERNATIVES

6.0 ENVIRONMENTAL ALTERNATIVES:

The impact evaluation process, discussed in the previous paragraphs provides adequate information about the environmental sustainability of the project such that the development alternatives that are being considered at the planning stage do not foreclose other options for future consideration.

The uncertainties exited with respect to the future implications of the either alternatives, the associated benefits, risks and economic viability have been analysed through impact evaluation methods.

However, the PMU of the project would conduct periodic assessment of environmental conditions at all stages of implementation and re-assess parameters for availing more positive weightages such that best project alternative in terms of environmental considerations is achieved.

6.1 DEVELOPMENT ALTERNATIVES CONSIDERED FOR LBC:

In the planning stage, Rengali Irrigation Project comprising of a barrage structure across river Brahmani, creation of a pondage and utilization of pond water for irrigation through two major canal systems namely LBC & RBC etc. is considered site specific through engineering survey and technical feasibility.

Such a feasibility conducted already by the project planners includes exercises on the following aspects:

I. Location alternative
II. Design alternative
III. Operational alternative

I. Location Alternatives Considered

a) Head Works Planning :

On the basis of engineering survey and site suitability, the head works of the barrage near Samal village was considered ideal and was technically acceptable by the central water commission (CWC) Govt. of India. The designed components are

- Pond level EL 76.20m
- Maximum water level EL 79.50m
- FSL of Canals EL 75.50m
- Pond Capacity 20.10.Million Cum

With above controlling elevations the location of head works is site specific.

b) Alignment Planning:

The irrigation system comprises of two main canals namely the Right Bank Canal (RBC) and Left Bank Canal (LBC), which off take from the pond at both flanks of the barrage. (Map furnished in **Fig.No.C1-1**)

- The LBC has been designed as a contour canal which traverses along a defined contour to find its ayacut in between the canal and doab of rivers Brahmani and Baitarani.
- In the process, the alignment of the Left bank canal was fixed judiciously and taken to 141km run up to Right bank of river Baitarani covering the ayacut of 1,14,300ha under four districts (Angul, Dhenkanal, Jajpur and Keonjhar).
- As per the norms of aligning the contour canal, the Left Bank Canal did not have many options to exercise for location alternatives.
- The final alignment thus considered environmentally sustainable was agreed by the Central Water Commission (CWC), Govt. of India.
- However, the canal alignment was finalized with involvement of minimum forest land, avoiding village habitations as far as practicable and after ensuring environment compatibility.
- The alignment of subproject LBC–II Phase–II commencing from 71.313km to 141.00km does not involve factors which may induce change of planning and consequent need to re-set the locational alternatives.

II. Design Alternatives Considered of Mega Herbivores (Elephants):

a) Methodology For Crossing Elephant Corridors :

- Left Bank Canal (LBC) in its 141km traverse encounters some identified elephant passages at several locations. This aspect being an environmental sensitive issue, the Ministry of Environment & Forests (Govt. of India) has directed the project authorities to design structures on the wild animal crossing points as corrective alternatives.

- Irrespective of the cost involvement the said transit paths have been designed according to the wildlife conservation norms and as prescribed by Forest Department.

- 28 no.s of EFRs including one super passage have been approved. Of which 23 no.s are already completed in the earlier subproject LBC-II Phase–I. Field study reveal that these are functioning effectively.

- Similar such crossing structures will be decided at strategic locations of the present area. The Dhenkanal Forest Division and Cuttack Forest Division of Odisha will identify those crossing points for taking up specific survey and engineering design of structures.

b) Methodology for construction of canal in very high ridges between RD 100.49km & 103.46km.

The alignment of LBC meets a very high ridge with a maximum cutting of 30m, appearing for a length of 2.97km between RD 100.49km and 103.46km

Approach:

Three viable design alternatives were picked up both from environmental and techno-economic feasibility considerations so as to decide the best alternative.

I. Cut and cover methods
II. Open cut method
III. Tunneling method

Table No. C6-1: Comparison of Alternative (Ranking Matrix)

Sl. No	Description of issues	Alternative I" Cut & Cover"	Alternative II "Open cut"	Alternative III "Cut Tunnel"
1	**Environmental Issues**			
	I. Land erosion	High	Very high	Minimum
	II. Disturbance to vegetative cover	High	Very high	Minimum
	III. Natural drainage obstruction	Moderate	High	Minimum
	IV. Impact on water quality due to silt intrusion	Moderate	Very high	Minimum
	V. Risks for cattle folk	High	High	Moderate
2	**Constructional Issues**			
	I. Excavation difficulty [Max 30 m / min 21 m depth]	High	High	Minimum
	II. Disposal of musk materials	High	High	Minimum
	III. Construction approach	Machinery & skilled labour	Machinery & labour	Machinery & skilled operator
	IV. Risks of Accidents	Moderate	Very high	Minimum
3	**Cost of component**	Very high, minimum [+ 400 cr.]	Minimum	Moderate [+100cr.]

Tunneling as the Most Feasible Alternative:

Broad issues discussed in the matrix described above were discussed in the technical advisory committee held during 2011.

- Although open cut method is cost effective i.e. minimum cost amongst the three approaches, it entails high risks of environment degradation as well as most accident prone.
- The 73rd TAC has approved the Tunneling method as the best design alternative and has recommenced the option to CWC (Design Directorate) for further scrutiny and approval.
- Three tunnel alternatives referred to CWC is illustrated in **Fig.No.C6-1.**
- Confirmatory drill holes have been executed to assist design.
- The feasibility of extending the Tunnel up to RD 104.50 km i.e. beyond the Express highway crossing is also being examined to minimize impact on heavy traffic load.

III. Operational Alternative:

Comparison of losses & benefits are discussed under this alternative study.

- The recommenced Tunneling method involves much less environmental degradations, minimum of silt intrusion during the rainy season and restoration of water quality although construction techniques require skill & expertise.
- There may be some negligible loss of command due to head loss in the closed conduit but this will be compensated by the incremental increase in lift command.
- Post construction accidents are minimum amongst the three approaches.

6.2 SUMMARY OF ALTERNATIVE STUDY:

From the already discussed considerations, the designed alignment of LBC-II Phase-II by and large is considered as the most acceptable alternative from both environmental consideration, and Design & Operational Consideration.

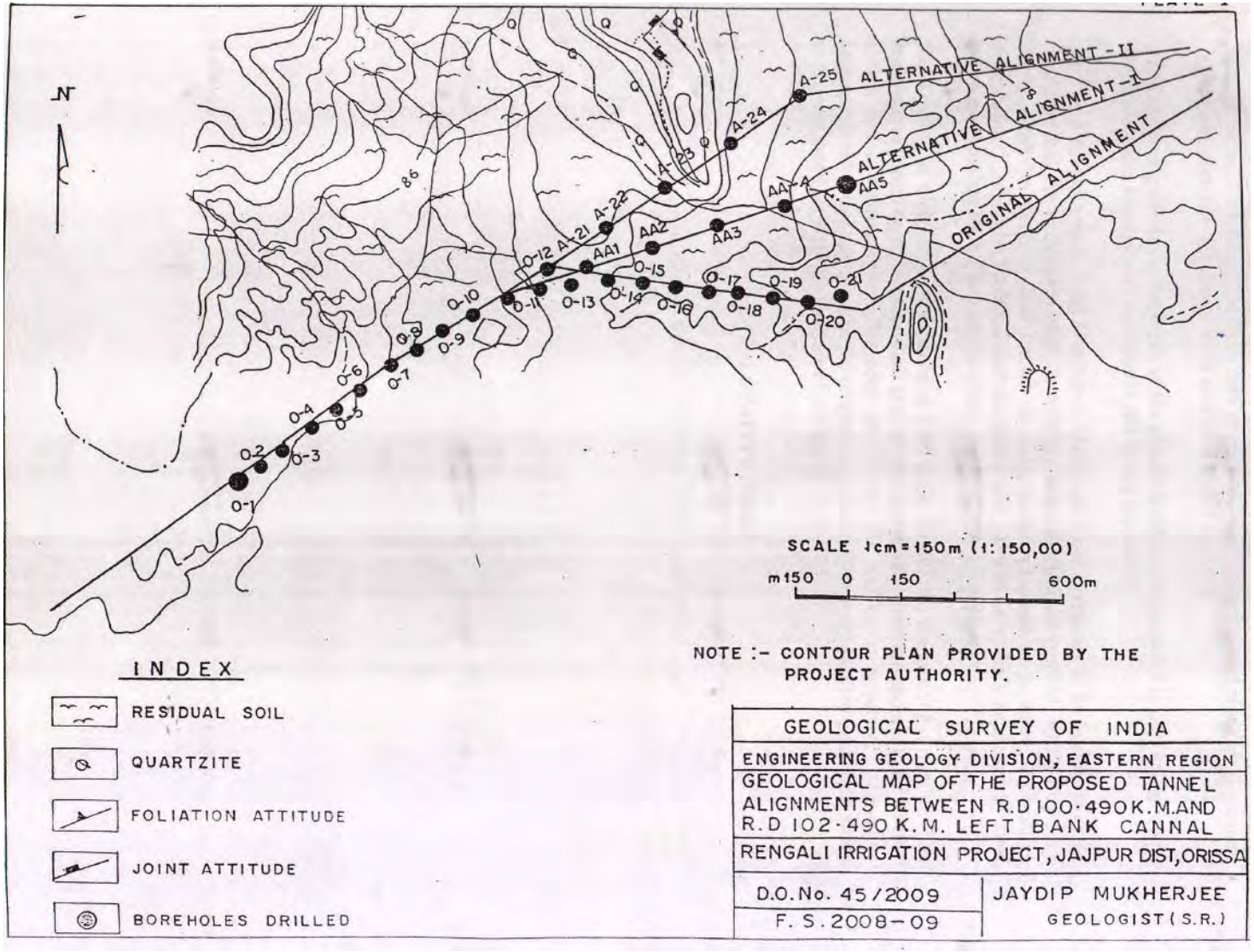


Fig.No.C6-1: Alternatives for feasible tunnel location

CHAPTER -7
ENVIRNMENTAL MANGEMENT PLAN (EMP)

7.0 GENERAL:

The state Government while implementing water resource Development projects have scrupulously complied objectives to impart high living standards and better quality life for its citizens, especially the agriculture based farming community. The sustainable development approach ensures suitable balance between higher levels of economic growth and maintenance of good environmental quality. It is with this objective at the background, the project authorities have layed emphasis on the preparation of appropriate management plans against various negative environment impacts which may appear during the implementation of the sub-project LBC-II Phase-II.

Based on the environment baseline conditions and impacts assessed earlier, for planned project activities, this chapter deals with the set of measures to be adopted to minimize the negative impacts and maximize the positive ones.

The table including entire ESMP based on "guidelines for Environmental and Social considerations" is shown in Annexure No. XII (ESMP and ESMoP).

7.0.1 Preparation of Environment Management Plan (EMP):

The EMP should ensure that;

- The objective of the Environmental Management Plan (EMP) is to minimize stress on the natural resources within its carrying capacity.
- There should be thorough understanding of the environmental base line conditions followed by appropriate evaluation of impacts.
- To chart out appropriate management strategy including mitigation measures against all those negative impacts which are critical and likely to adversely affect the environment.
- To integrate the management measures in the overall projects planning, designing, construction and operation phases.
- To ensure that there are adequate funds/resources, budgeted for implementation of EMP and supervision (Monitoring) activities.
- In the overall perspective the management methods should be charted out according to the Policy, Acts and Local Legislation and are acceptable to the stakeholders/public.

7.0.2 Approach Techniques:

7.0.2.1 Approval/Clearance from Competent Authorities:

On the basis of baseline data and identification of negative impacts, certain issues need prior permission from competent authorities. The Project Management Unit (PMU)/ Chief Engineer of the project will ensure that relevant appropriate clearance / permission are availed prior to implementation of the project.

Table No. C7-1: Approval / Clearance Required

Sl. No	Issues	Clearance required	Approving authority
1	Permission for tree cutting along canal alignment	Clearance of Forest proposal	DFO of concerned district
2	Solid waste disposal permission	Clearance by State Pollution Control Board (consent to establish & consent to operate)	Land demarcation by Revenue Authorities (Tahsildar)
3	Resettlement and Rehabilitation	As per State R & R policy 2006 and Subsequent amendments	Since there is no displacement of population approval from State Government not required.
4	Land acquisition for various project requirement	Application according to the provisions of LA Act 1894	From Revenue authorities Govt. of Odisha

7.0.2.2 Funding Strategy / Budgetary Provisions:

Since the environmental management is grossly integrated with the overall planning and implementation of the project, appropriate funds provisions in the project cost estimate becomes imperative.

Environment cost estimate will be prepared taking into consideration likely expenditure for amelioration of the environment. Shortfall if any compared to the budgetary provision should be re-appropriated through Revision of Project Cost.

7.0.2.3 Institutional / Organisational Support for Management Planning:

The success of implementation of the environmental management plan depends mostly on technical expertise, efficient staffing pattern and institutional

strengthening. The DoWR (GoO) has agreed in principle for constitution of Project Management Unit (PMU) for implementation of project and conducting monitoring activities as per plan. The PMU structure is furnished in 4.2.3 pg C4-10.

Apart from the above, the Department of Water Resources will associate with other line departments of the Govt. of Odisha, like Agriculture, Forest and Environment, Revenue, Health and Tribal Development Department etc for availing technology support and implementation backup through the existing Project Level Environmental Management Committee (PLEMC). This has been notified by GoO vide resolution dated 27th Sept 1997, later amended on 15th Sept 1997. Copy furnished in **Annexure No. XVII.**

7.0.2.4 Public Participation & Training Programme:

Public Participation:

Public involvement in decision making of water resources projects is being encouraged on grounds of ethics and pragmatism. The objectives of management plan as well as anticipated results of implementation are being placed before the public/beneficiaries through meetings. The feedback will help reduce the misconception about the adverse effects of the projects.

Training:

Certain general aspects and environmental aspects need to be thoroughly understood by the beneficiaries through training programme. The environmental training is aimed at building awareness of environment as a whole and clear understanding of various environmental issues.

The training is also intended for people whose activities and influence have an important bearing on environmental aspects of water management such as the Ecologists, Biologists, Hydrologists, Engineers, Agronomists, Foresters and Meteorologists etc. involved with the project. This should be achieved through short term programmes, workshops and Seminars etc.

7.0.2.5 Monitoring:

The items of the management plan which requires monitoring are grouped under two major groups:

- Items which require monitoring on a routine basis at frequent intervals.
- Items which are to be monitored periodically.

The former set usually requires field laboratories to be setup while the latter involves periodic trips to the site for visual inspection and perusal of office records.

The project authority will entrust this important activity to one of his divisions with well-trained staffing pattern in their organogram.

7.1 ENVIRONMENTAL ISSUES CONSIDERED IN THE MANAGEMENT PLAN:

While preparing the management plan for critical environmental issues, it becomes necessary to refer appropriate guidelines prescribed by the Ministry of Environmental & Forests (MoEF) Govt. of India, World Bank Operational Policies, JICA guidelines along with lessons learnt from completed JICA funded projects.

The proposed management plans include:

I. Command area management plan.
II. Management plan against crossing of Natural Streams & Nalla.
III. Management plan against water logging and soil salinity.
IV. Soil fertility Nutrient management plan.
V. Management plan against aquatic weed infestation.
VI. Management plan for health delivery.
VII. Water quality management.
VIII. Construction management.
IX. Communication management.
X. Fertiliser management.
XI. Management plan for preservation of Archaeological & Historical monuments.
XII. Management plan of Wildlife

These are described in following paragraphs.

Environmental Management plans are discussed in two principal phases of project cycle; namely

- Management measures during construction phase
- Management measures during operational phase

7.2 MITIGATION MEASURES DURING CONSTRUCTION PHASE:

Impact areas during the construction phase of the project cycle have been discussed in Chapter-5. Mitigation measures against significant negative Impacts induced by some project activities during the construction period are covered by the management plan. These are:

I. Management of labours camps for Construction workers
II. Management of water quality
III. Air quality Management
IV. Noise level management
V. Management against vibration effect
VI. Construction area Management

7.2.1 Management of labour Camps for Construction Workers:

- The canal excavation works, concrete lining and construction of structure etc. will be entrusted to contract agencies who will deploy both machinery and man power for execution of works.
- Unskilled labour force will be engaged from the nearby villages on daily wage basis. They are expected to stay at their homes and join the work force.
- Some skilled and semiskilled labourers like mechanics, operators, fitters etc. are required to be engaged for the work from outside the locality. These labourers need to be housed in temporary labour camps at different locations to be distantly placed.
- Aggregation of imported labourers in the labour camps may likely put considerable stress on the prevailing biotic and abiotic environment.
- The objective of this management plan is to minimize such stresses on environment as well as to ensure safety of the human work force.

The proposed management plan features the following activities;

(A) Size of camp and camping locations

- There may be as many as 36 to 40 large contract packages for construction/execution of works. Each agency will have their camping locations at distant places spread along 40 km stretch of the main canal reach and inside the ayacut.
- Each labour camp may house 50 to 60 imported labourers.
- These camps should be located away from the existing village households to prevent likely social conflicts.
- Necessary permissions may be obtained from the respective revenue authorities, panchayats. The project authorities should be appraised of such camping locations.
- Temporary hutments should be provided by the respective agencies to house labourers and their families, with provision of minimum needed infrastructure facilities, like water supply, sanitation and electricity etc.

(B) Supply for free fuel

- These labour forces may adopt unscrupulous methods for cutting of trees and bushes for meeting their fuel wood requirement which would destroy the adjacent green cover and affect the ecology.
- The project authorities should ensure supply of free fuel to these laboureres through the contract agencies so as to prevent such unscrupulous activities.

- Arrangement may be made with the nearby Civil Supply Authorities to extend Kerosene oil depot facilities. Supply of kerosene oil at a fixed quota may be made available for the labourers.
- Use of LPG gas cylinders may also be arranged for intending labourers. Such supply should be ensured during the construction period.
- The contract clause should ensure these fuel supplies free of cost to the labour force and include the cost component in the contract items.

(C) Sanitation

The following sanitation facilities are to be provided free of cost.

Sewage disposal:

- Each labour camp should be provided with community toilets with septic tank and soak pit arrangement.
- The number of such temporary toilets may be one for each 10 families of the camp.
- The camping area should be periodically sprayed with bleaching powder and other disinfectants.

Drinking water supply:

- Drinking water supply may be made available to the camped labourers. For this propose there may be at least one/two deep bore well water supply points in each colony of 50 families.

Solid waste disposal (Domestic refuse):

- The camped labourers should be advised to gather all household refuses in a waste collection bin. The contents of these bins are to be carried to the waste collection pits by wheeled carts where it would be periodically covered with earth.

(D) Health delivery:

The imported labour communities may spread alien diseases to the endemic population in the nearby villages. They may also suffer with occupational diseases during the camping period. The Project authorities should ensure that the health status of the labourers is maintained properly so as to prevent spread of diseases and improve working environment. The following health delivery activities should be adhered to,

Periodic health checks up:

- The project authorities should provide appropriate clauses in the contract agreement that contracting agency stands responsible for extending free health check up of labourers in regular intervals.
- The project authorities will also interact with the local health authority and facilitate such health delivery activities.

Activities to prevent spread of malaria:

- The labourers in the camp should be properly educated about the Malaria attack and relevant preventive measures to be followed.
  The contract agency should ensure activities described here under.
  - Supply of mosquito nets free of cost
  - Supply of mosquito repellants to the labourers.
  - Periodic cleaning of the area to destroy stagnant water pockets and spraying of disinfectants through health workers.
  - Supply of preventative medicines to all labour force free of cost.
  - Ensure imparting free treatment to the affected people through local health centers.

The project authority has considered these health delivery measures and included relevant provisions in contract packages.

7.2.2 Management of water quality:

During the construction activities inside the command area, there are possibilities that the local water bodies may be affected due to

- Admixture of machinery washouts/effluents
- Unscrupulous disposal of solid wastes
- Cleaning & washing

Such activities should be strictly prevented both by the executing agency and by the project authority. It may be ensured that,

- Discharge of colony effluents should not be allowed to enter into nearby water body. Sewage disposal to be ensured through septic tank and soak pit method.
- Water quality of the local water bodies are to be tested periodically for polluting parameters. Data to be monitored by PMU.
- Ponds and stagnant water bodies should be carefully disinfected taking in to consideration the existence of fish species.

- Water from such areas should not be used for cattle feed and if possible human bathing especially during the construction period.

7.2.3 Management of Air Quality:

Ambient of air quality is likely to be affected during the construction period considering increased traffic load on village roads and dust pollution during excavation activities.

The project authorities will ensure the following mitigating measures.

- In case the trucks and dumpers are to use the village road, the stretch of road should be black topped/ concreted as the case may be.
- Simultaneously, the machinery used should be properly maintained.
- The roads, other than black topped/ concreted, should be sprinkled with water through tanker mounted tractors/Trucks.
- By-passing narrow village roads for temporary construction traffic should be explored by the executing agency.
- The traffic should be restricted to a schedule where in the villages avail their rest period without much disturbance. Speed limit should be minimum.
- Trucks carrying construction materials or loads of spoils etc. should be covered with tarpaulins.
- Dust generation should be minimized by water sprinkling.

7.2.4 Management of Noise level:

Ambient Noise level may be affected during the construction period by use of various machinery and equipments. This may affect the human health psychologically.

The project authorities should ensure the following mitigating measures.

- The operation of drilling and blasting should be restricted to a scheduled time as per the provision of Explosive Acts.
- Night time construction activities should be avoided as far as practicable.
- The heavy earth moving machineries & equipments should be spaced apart to prevent high Noise level beyond the permissible Noise level (Preferably restricted to dB(A) 70 to 75)
  (Ref: Environmental Engineering P/729 by ARCADIO P. SINCE RO-1999)
- The workers may be advised to use ear plugs during the working period.
- The transport vehicle should be oiled and properly maintained to reduce high noise emissions.

- Honking of vehicle in forest area and at sensitive receptors should be prohibited during the construction period.

7.2.5 Management against Vibration effect:

Risk Management:

Sl. No.	Activity	Risk Factor	Management
I.	During Construction: Removal of excavated spoils from the zone of operation involves machineries like cranes, loader, and dumpers. Improper maintenance of machineries may lead to accidents.	High	• Ensure Daily / periodic maintenance of machineries and equipment's. • Display Caution Notices • Set up 'First Aid' Centre with Ambulance facilities • Ensure safety training schedule for unskilled workers.
II.	The tunnel boring Machine (TBM) while in operation will generate high noise level. This noise pollution may cause adverse health problems in nearby locality hutments etc.	Moderate	• Limit the tunnel operation period from 7am to 1pm and from 3pm to 8 pm so that the rest period synchronises with rest period of people. • Ensure no noise period during the rest hours of public / villages • Ensure periodic free health check-up.
III.	At the sensitive receptors (Schools, Hospitals, and oblige rehabilitation Centres) along the tunnel alignment, the villagers / inhabitants life style may be disturbed temporality due to risk apprehension.	Moderate	• Demarcate 'No entry Zone' for the public • Arrange grievance redressal meetings with the public every month. • Avoid conflict between people and executants • Ensure cooperation

			from stakeholders. • Safety "Siren Blowing"
IV.	Plying of heavy vehicles on the villages roads, involve risks of accidents, air & noise pollution	Moderate	• The traffic for heavy machineries carriers and transport vehicles should preferably be diverted from the close hutments (Nadiabhanga Village) • Village roads to be widened • Intermittent spraying of water during work period.
V.	Setting up of contractor labour camps	Minor	• Camping site for construction labourers should be located away from the villages & from the site of operation.

7.2.6 Construction Area Management:

The project authorities should ensure some common mitigation measures as mentioned below to improve / upgrade the general ecology of the adjacent areas at the construction locality.

- **Filling/Leveling of Borrow Areas**:

  All burrow pits should be backfilled and leveled after the construction works. It may be ensured that no ditches / pockets are left which may hold water and can be stagnated to create breeding place of mosquito vectors.

- **Removal of construction Debris** :

  Concrete and masonry wastes are sometimes left at the structure sites after completion of works.

  The executing agency should ensure removal of the wastes after completion of works. The solid wastes are to be disposed off according to the provision of local law. Permission from authorities to be obtained.

  Concreting works may be carried out from a one point delivery i.e. by using a batching plant and transportation of materials to work site by transit mixers.

- **Transportation Methods**:

Trucks and dumpers carrying the construction materials or the spoils (Construction wastes) should be covered with tarpaulins to prevent air pollution.

- **Up-gradation Measures (Plantation)**:
  - The backfilled areas and structure sites should have plantations to enhance aesthetics of the area.
  - Ensure plantation of flowering species at the structure sites.
- **Safety arrangement (First Aid Facilities):**
  - Ensure safe working environment by providing safety appliances like safety helmets, masks etc. wherever and whenever necessary.
  - All major structure sites will maintain First Aid Centers. Ambulance Facilities should also be provided.

Management Methods during construction of Tunnel:

I. Muck Disposal:

Tunneling is proposed to be carried out form RD 100.49 km. This may involve muck generation of about 270 $T.M^3$ requiring appropriate disposal without disturbing the adjoining Environment.

a) Environmental Up-gradation:

Use as a fill material for abandoned stone quarry areas about 10km away. Necessary permission from the district revenue authority will be availed.

b) Reclamation of low lands acquired by Industries for setting up Industrial Colony:

The tunneling site being very near to the Kalinga Nagar Industrial belt, some Industrial Entrepreneurs need many backfilling materials for setting up labour colonies. Their requirement may be met out of these muck materials. The project authority will arrange for disposal at the cost of the users.

II. Dewatering from Tunnel:

1. During tunnel boring operation, dewatering maybe necessary to control excess seepage of ground water
2. Dewatering operation should be carried out at regular intervals. For dewatering some sludge pumps may be used.
3. Discharged water from the pumps may be collected in a sump and then led to the nearest natural drain through open channels.
4. Some lifts points may be provided @ 1.70 km distance. These should be operative continuously so as to deplete the Ground Water Table (GWT) whenever necessary.

III. Management of Surface Drainage :

1. During the progress of work any heavy rainfall/ precipitation may flood the work site and tunnels.
2. This may not only cause temporary hindrance to work but also cause soil erosion.
3. To prevent occurrence of such situation, the project authority will arrange to provide catch water drains at the left side (Hill Side) flank which will be carried till it meets the natural drainage.

IV. Management of Ecology:

Adequate plantation should be taken up all along the alignments and beautification of the area will be ensured.

7.3 MITIGATION MEASURES DURING OPERATION PHASE:

7.3.1 Command Area Management Plan:

In the irrigation development sector of Odisha Rengali Irrigation Project plays a vital role in delivering irrigation benefits to 2,18,392 ha of CCA spread in five district. Of the 1,14,300 ha of CCA contemplated in its left bank canal system (LBC); the completed status is 36.16% (41,333 ha) through World Bank and JICA funding. The concluding phase LBC–II Phase-II is its largest phase having its command area 72,967 ha constituting 63.84% of total targeted under LBC system. This huge command area presently practicing with rainfed agriculture needs appropriate management interventions for maximizing the agricultural benefits through scientific methods of irrigated agriculture. Prior to discussions of the shifting process, approach and management techniques, the present status of the command area need to be studied thoroughly.

7.3.1.1 Description of the command Area (LBC–II Phase-II CCA 72,967 ha):

(1) ENUMERATION OF AYACUT:

The command area under LBC-II Phase–II, system is 72,967 ha spread in three district i.e. Dhenkanal, Jajpur, and Keonjhar district. The District wise – Block wise ayacut details are as follows.

Table No.C7-2: District wise– Block wise Ayacut

Name of District	Name of Block	Ayacut CCA in (ha)
DHENKANAL	Kankadahada	600
	Bhuban	9756
Total	**Dhenkanal**	**10356**

JAJPUR	Sukinda	13,920
	Danagadi	10,009
	Korai	22491
	Rasulpur	180
Total	**Jajpur**	**46,600**
KENOJHAR	Ghasipura	13205
	Anandpur	2806
Total	**Keonjhar**	**16011**
Grand Total	**LBC-II Phase-II**	**72,967**

For Dhenkanal District:

- Irrigation Potential already created by completed phase of RIP (From 00 to 71.313 km) = 41166 ha
- Irrigation potential proposed under Phase II (From 71.333 to 141 km) = 10,356 ha

Total additional command area under Dhenkanal District =51,522 ha

(2) Description of Land Status Arable Land Vrs Proposed Ayacut Area

Block wise Land Status in concerned districts are shown below.

Table No.C7-3: Blockwise Land Status Vrs Proposed Ayacut Area

Sl.	Name of the District	Name of Block	Geographical Area (in sq km)	Net Down Area (in ha)	Area Proposed under LBC-II Phase-II Command (in ha)	Percentage of Down Area
1	Dhenkanal	Kankadahada	589.23	12506	600	4.79%
		Bhuban	253.96	12989	9756	75.11%
2	JAJPUR	Sukinda	384.37	19507	13920	71.36%
		Danagadi	477.34	10285	10009	97.31%
		Korai	336.13	20633	22491	109%
		Rasulpur	162.69	8272	180	2.17%
3	KEONJHAR	Ghasipur	350.19	20519	13205	64.35%
		Anandpur	295.90	11530	2806	24.33%
		Total			**72,967**	

Source: District statistical Hand Book – 2007, Directorate of Economics & Statics (DOE & S) Govt of Odisha

In Korai Block of Jajpur district, proposed ayacut is more than the net area sown (assessed at 2009), which implies that large area have been reclaimed and made cultivable. Similar occurrence may have contributed to the net sown area in case of Danagadi Block (Jajpur). Rasulpur Block has 2.17 % of its sown area coming

under the LBC-II Phase-II command. This figure should go up by providing additional irrigation schemes (including lift).

(3) Soil Character Of Command Area:

According to the Agroclimatic zoning of broard soil groups of Odisha, the command area of LBC-II Phase-II is described as follows.

Box No. 13: Soil groups of Agroclimatic Zone

Districts	Agro Climatic Zone	Board Soil Group	Equivalent names in soil Taxonomy
Dhenkanal and Jaipur	Mid Central Table land (Hot & Dry sub humid)	Alluvial Red Lateritic Mixed Red and Black	Ustochrepts Haplaquepts Haplustalfs Rhodustalfs
Keonjhar	North Eastern Ghat land (Warm & Humid)	North lateritic Red brown Deltaic Alluvial	Tropaquepts Ustropepts

Source: AGRONICA BY Directorate of Agriculture and Food Production (DoA & FP) Govt. of Odisha.

Lateritic Soils:

This type of exists in parts of Dhenkanal and Keonjhar districts. These are poorly fertile with low organic matter. Available Nitrogen & Phosphorus are low and potash is medium. Crops can be raised better in this type of soil by proper soil management i.e. liming and application of organic manure and use of balanced fertilizers. Water soluble phosphatic fertilizers will increase the crop yield.

Deltaic Alluvial Soils:

This type of soil is predominant in Jajpur district. Textural class of the soil varies from coarse sand to clay and mostly dependant on the geomorphology of the flood plain and type of alluvium carried lay floods. Water holding capacity of the soil is high. Drainage is difficult due to slow permeability and is prone to water logging.

Mixed Red and Black Soils:

These types of soils are seen in parts of the command area of Dhenkanal and Keonjhar districts. The soils are light to medium textured having neutral pH value.

The low land soils growing Rice are deficient in Zinc and exhibit medium fertility status. Crop cultivation can be improved by application of adequate fertilizers.

In overall scenario, the command area soils are suitable for irrigated agriculture by adopting soil testing and appropriate fertilizer recommendations.

7.3.1.2 Present Practice Of Rainfed Agriculture:

The farming community of the command area are adapt to rainfed agriculture. Khariff cultivation is the common practice while, Rice is the main crop cultivated during the monsoon. In few locations pulses, oil seeds and vegetables are raised by using lift source.

[A] PRESENT CROPPING PATTERN

In the rainfed agriculture the following crops are commonly cultivated by the farming community.

Table No.C7-4: Rainfed Cropping Pattern (A=72967 Ha)

KHARIFF CROPS	CROPPED AREA(ha)	YIELD RATE Tons/ha	REMARKS
(i) paddy	13864	2.0	
(ii) Early Paddy	15052	2.0	
(iii) Medium Paddy	5941	2.0	Net production value is calculated as per production cost.
Total Paddy	34857	-	
OTHERS			
(iv) Pulses	3961	0.4	
(v) Mix Vegetable	792	5.0	
Total Other Crops	4753	-	
Grand Total	**39610**		

Source: as per report by Deputy Director Agriculture, Jajpur dated 28th Jan. 2014

[B] PRESENT YIELD RATE:

Due to erratic behavior of monsoon rainfall, the yield rate of Khariff Crops shows wide variation from place to place in the same district, But the Agriculture Department have standardized yield rate of Khariff crops for each district.

The assessed yield rate for rainfed cultivation has been shown in **Table No.C7-5**

Table No.C7-5: District Wise Area/Yield Rate/Production Of Crops (Yr 2009-2010)

District	RICE	CEREAL	PULSES

	A	Y	P	A	Y	P	A	Y	P
Dhenkanal	109.80	1562	171.54	112.78	1553	175.14	66.28	475	31.75
Jajpur	142.77	1824	260.43	146.40	1809	264.79	60.59	357	21.65
Keonjhar	195.51	1443	282.17	224.72	1441	323.90	75.02	483	36.27
Bargarh	311.73	2218	691.47	314.02	2212	694.67	78.28	420	32.91
Cuttack	141.16	2087	294.54	143.41	2073	297.22	113.73	422	47.91

Source: Odisha Agriculture Statics 2009-10 By DOA & FP, Govt. of Odisha

Notation Used. A= Cropped area in' 000ha

Y = Yield Rate in kg/ha

P = Crop Production in 000 M Ton

FINDINGS:

From the above comparative statement it may be seen that the principal crop Rice in adjoining Baragarh district is highest i.e. 691.47 T. M Ton where as the average Rice Production in Dhenkanal, Jajpur and Keonjhar districts is 238.04 T. M Tons. It lacks behind Baragarh by 34.42%.

In case of cereals, again Baragarh district hails high yield rate & production at 694.67 T. M. Tonne as against average cereal production in three command area districts at 254.61 T. M. Tons. it lacks behind Baragarh by 36.65.

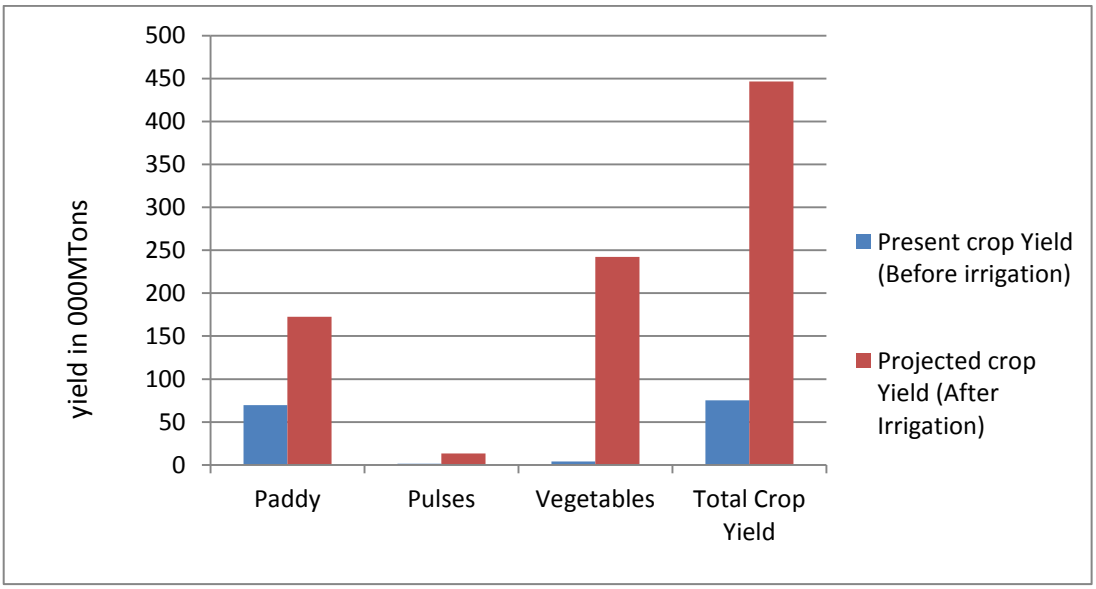
Such wide gap in the production quantity may be due to the fact that Baragarh is advantaged by irrigated agriculture while the present command area of LBC–II Phase–II exhibit 75.258 TM Tonnes by way of rainfed agriculture. The projected crop output after irrigation is contemplated at 339.481 TM Tonnes. This rate of production would be rational when compared with the irrigated commands of adjoining districts of Odisha.

[C] COMPARISON OF PRESENT KHARIFF CROP YIELD (PRE PROJECT) AND PROJECTED CROP YIELD (AFTER IRRIGATION)

Table No.C7-6: Comparison of Before Project and After Irrigation crop yield

Sl. No	KHARIFF CROPS	Paddy (000 M Tons)	Pulses (000 M Tons)	Cereals (000 M Tons)	Vegetables (000 M Tons)	Total (000 M Tons)
1	Present Khariff (Pre- Project)	69.714	1.5845		3.96	75.258
2	After Irrigation (Post Project Projection) Khariff & Rabi	172.42	13.281	18.64	242.32	446.661
3	Increase in Crop Yield	102.706	11.697	18.64	238.36	371.403
4	Percentage Increase	147.32%	738.45%	100%	Very high	439.50%

Benefit in Crop Yield Shown in Bar-Chart



Analysis:

- *Khariff* is the predominant Crop in the LBC-II Phase-II command area which may be brought in to comparison and estimation of the crop benefit.
- It may be stated that contemplated post project (After Irrigation) benefits are enormous including Rabi cultivation; while *Khariff* paddy benefit will be raised by 147.32%.

7.3.1.3 Irrigated Agriculture Planning:

As against uncertain outcome from rain-fed agriculture, the command area of LBC-II Phase-II will receive assured water supply during the various phases of

crop cultivation. Shifting of methodology to beneficial scientific techniques of irrigation especially through rationalized distribution of irrigation water along with other supporting activities will contribute to enhanced crop production and socio-economic growth.

Various activities involved in the irrigated agriculture practice are mentioned below:

1. Command Area Development and water management.
2. Cropping pattern and water requirement.
3. Dissemination of crop cultivation technology to the farming community.
4. Fertilizer and Pesticide Management.

7.3.1.4 Command area Development and Water Management:

Objective: Command area development and water management is the key component of an irrigated agriculture scheme, introduced by Government of India (Centrally Sponsored Scheme) since 1976-77. Its main objective is to reduce the gap between the irrigation potential created and utilized. The activities under this programme aim at,

- Equitable distribution of the available irrigation water
- Active involvement of farmers through Participatory Irrigation Management (PIM)
- Enhancement of Agricultural productions/Crop productivity.

Programme Components: To achieve higher Crop production the following management activities are recommended.

Sl.	Components	Activities Under CADWM
1.	Topographical Survey	Topographical Survey of the entire command area for fixing alignment for construction of field channels and field drains. The land for the purpose is to be voluntarily contributed by the beneficiaries through Pani Panchayats
2	Construction of Field Channels	Field Channels are to be constructed to facilitate water supply from canals (Distributary, Minors and Sub-minors etc) up to the tail end of Chaks without much losses. It helps preventing water supply in judicious manner to each field.
3	Construction of	Field drains are to be constructed to drain out surplus

	Field Drains	water from the agricultural land to the nearest trunk drain. It helps preventing Water-logging in the crop field.
4	Reclamation of water logged and saline lands	Existing water logged and saline areas in the commands need to be reclaimed through provision of surface drains as well as subsurface drainage system.
5	Farmer's Training	Farmers of any particular command area need to be properly educated about the water management and crop cultivation procedures. This is an important activity to enable farmers to learn modern technologies of irrigated agriculture; a strategic shift from rain-fed agriculture.
6	Correction of System deficiencies	Correction of system deficiency through monitoring activities is an important feature in CAD&WM programme. Corrective measures are to be implemented by farmers under the WUA (Pani Panchayats)
7	Institutional Support to WUAs	To render support to WUAs in the matter On Farm Development (OFD) activities

COST NORMS:

- Cost norms and funding pattern for CAD-WM works are fixed as per Govt. of India Guideline which are modified from time to time.
- The cost norm/ceiling recommended for LBC-II Phase-I were as follows:

Box No. 14: CADWM COST NORMS

Sl. No.	Item of works/ Activities	Ceiling in Rupees per ha & per No	Fund Sharing		
			Central Share	State Share	Farmer's Share
1	Topographical survey and investigation	1000	50 %	50 %	Nil
2	Construction of Field Channel	15000	50 %	40 %	10 %
3	Construction of	4000	50 %	50 %	Nil

	Field Drains				
4	Crop demonstration	5000	75 %	25 %	Nil
5	Farmer's Training (no.s)	10800	75 %	25 %	Nil
6	In Institutional support to WUA's	1000	45 %	45 %	10 %
7	Reclamation of water logged area	15000	50 %	40 %	10 %

Source: Annual Report – DOWR and Action Plan for CADWM-LBC-II Phase-I.

The project authority may estimate expenditure in CAD-WAM works for LBC-II Phase-II CCA 72967 ha and associate CADA Organization functioning under DoWR.

INSTITUTIONAL SUPPORT:

Directorate command area development and participatory Irrigation Management. [CAD & PIM]	Functioning under DoWR since 2007-08; to provide CAD & WM benefits to all irrigation projects
Support Units	
O & M (Operation & Maintenance) unit	To look all O & M activities
CAD(Engg) Unit	To look after CAD Activities water management and water Audit
Pani Panchayat (PP) support unit	To look after formation of Pani Panchayats, its Capacity Building Functioning and strengthening

SUGGESTIONS:

- The Project Authority should seek association of CAD & PIM Directorate in implementing Command Area Development and Water Management programme.
- Physical and financial break-up of the programme components should be documented.

7.3.1.5 Cropping Pattern and Water Requirement:

- Fixation of a conducive cropping Pattern for the irrigated command area forms a basic tool to uplift the crop productivity and ensure sustainable agricultural development.

- Contrary to the single crop cultivation (*Khariff*) in rainfed agriculture; Irrigated agriculture aims at double cropping with cultivation of cash crops which becomes effective through selection of a cropping pattern.
- It pre-supposes that Rengali Irrigation Project through construction of Samal Barrage will meet the crop water requirement for 2,18,392 ha of CCA spread under five districts. The Left Canal Bank (LBC) takes care of the crop water requirement for 1,14,300 ha CCA.
- Agro climatic conditions castes big influence on the type of crop to be grown in the command area whereas contents of the soil mostly regulate the selection of irrigated cropping pattern.

Considering the above in the perspective, the cropping pattern earlier envisaged in DPR of the project for LBC-II Phase-II (CCA 72967 ha) has been recently revised by the Deputy Director Agriculture (Dept. of Agriculture, GoO) on 28th Jan. 2014.

Table No.C7-7: Cropping Pattern Proposed for LBC-II Phase-II

Status	Season	Crops	Area (Ha)	Yield Rate (Qnty/Ha)
After project Irrigated Agriculture	i. Khariff	Paddy Early paddy Medium Paddy Pulses Vegetables	6990 11184 9786 11650 4660	35 35 35 08 200
	Sub-total Kharif		44270	-
	ii. Rabi	Paddy Early Paddy Vegetable Ground nut Patato Pulses	11557 7083 4660 9320 4660 4660	40 40 220 20 300 8.5
	Sub Total Rabi		41940	-
	iii. Perennial	-	2330	-
Grand Total (Post Irrigation)			88540	

Source: DPR-DoWR

CROPPING INTENSITY:

- Cropping intensity is one of the indices of the level of agricultural development.
- The state level cropping intensity of Odisha went up from 151% in 2001-02 to 160% in 2007-08. It is in the ascending term due to introduction of irrigated agriculture.

  (Source: Economic survey of Odisha 2008-09)

- The cropping intensity as approved in the DPR is 190 % for LBC-II Phase-II.
- The cropping intensity may undergo slight change due to revision of cropping pattern which may further be re-casted according to change of contributing factors during the project implementation period.

7.3.1.6 Dissemination of Crop Cultivation Technology to the farming Community:

- The farming communities of the command area are adapted to the rain-fed agriculture and are dependent on monsoon rainfall at rational distribution. But they are invariably distressed with crop losses due to irregular monsoon.
- The project aims at assured water supply and development of irrigated agriculture.
- The farming community will experience a strategic shift from present practice of rain-fed agriculture to the proposed cultivation methods under irrigated agriculture.
- Dissemination of crop cultivation technology from Agricultural Experts to the Farming Community is considered as a basic necessity for this project.

Some such innovative methods along with activities related to the agricultural development are described below:

A] Promotion of System of Rice Intensification (SRI):

- System of Rice Intensification (SRI) is an innovative technology to enhance the crop production significantly.
- Major changes in the SRI system are:
  - To transport nursery seedlings (7 to 12 days old)
  - To use 1 to 3 seedlings at a hill
  - To keep wider spacings (25 x 25) cm
  - To apply irrigation to keep soil moisture in tact by alternative wetting and drying (No flooding)
- SRI method deviates conventional agricultural technology by innovative cultivation system which involves integration of Technical, Managerial, Social and Agronomic factors.
- Benefits of SRI method:
  - Increase Rice Yield significantly
  - Makes effective integration of soil, water, nutrients and plant management.

- Does not involve high cost modern inputs.
- It helps improving the soil quality.
- It improves soil biodiversity and ensures sustainable environment.
- Can be practiced by resource poor farming community.
- SRI promotion is the best suited for irrigated areas.

- Constraints against SRI Promotion:
  - Farmer's fear to adopt the new method.
  - Not suitable for poorly drained areas.
  - Not suitable for rain-fed area (Flooding is undesirable)
- Action plan to promote SRI:
  - Policy enforcement by State Government.
  - Meetings and workshops to disseminate SRI technology to Farmers and explain advantage.
  - Field trials, Yield survey and Analysis.
  - Campaign by Agriculture Department.
  - Propagation of benefits through media coverage, village meetings & examples.
- Lesson Learnt Examples:
  - SRI promotion has been implemented in Rengali Irrigation Project.
  - Yield survey was done by NK-Nippon Koi Consultants which revealed that
    1. The yield rate in well drained command part comes to 6.0 tons/ ha.
    2. The yield rate in poorly drained location is reduced to 3.6 tons/ha.

SUGGESTION:

To fulfill the requirement for success of SRI, the DoWR and Department of Agriculture should develop Policy to promote SRI in Irrigation Project.

SRI should be practiced in Dhenkanal, Jajpur & Keonjhar Districts except for some water logged areas of Jajpur Districts

B] Introduction of A.I.P:

- Agriculture Intensification Programme (AIP) is to be introduced in the command area of LBC-II Phase-II.
- Problems faced by the farmers in switching over of technology to irrigated agriculture will have to be addressed through this AIP. Taking the cue from successful implementation of AIP in LBC-II Phase-I, the project authorities will entrust implementation of this programme through Experts under Command Area Authority (CADA).

The programme components include:

i. Dissemination of Khariff farming Technology:

The farmers of the command area may initially face problems to adopt this new AIP technology due to their age-old experience of Khariff farming, lack of adequate farming inputs and guidance.

The CADA organization will provide the necessary knowledge of AIP to farmers which mainly would include,

Soil Testing	Assist conducting on-field Soil Testing.
Guidance	Provide technical guidance to farmers in selecting crops; sequences wise cultivation methods, fertilizer application etc.
On Field Demonstration	On farm Demonstration in association with agricultural experts of the district.
Adaptive Trials	Adaptive Trials will be excised through close association with farmers of WUA.
Exposure Visits	Monitoring methods include timely visits by experts & providing solution to problems faced by farmers.

ii. Crop Diversification Technology

Farmers will be educated about the advantages of crop diversification methods. Other than the main crop paddy, Farmers may opt for cultivation of some cash crops & other upland crops (vegetables) during Khariff and Rabi season.

Crop diversification will help maintaining the soil quality of farm lands. Technology dissemination, on-farm demonstration assisting farmers in selecting crops & process support during the crop period will be provided by CADA and DoA experts; through their village Level Agricultural Extension Personnel (AEOs & VAWs).

WUAs should be strengthened to meet the various requirements during the farming and stay responsible for after farming co-ordination with the DoA / DoWR authorities regarding crop storage & marketing.

C] Other supportive Activities for water Management:

1	On Farm Development (OFD)	• Consist of activities related to Field survey, Investigation for micro-planning of command area. • Planning for construction of water courses, Field channels and Drainage provisions. • Micro-planning of the ayacut has been completed by the project authority. • Organization support by CADA and DoA. • Farmer's Training Programme and involvement of WUAs
2	Operation & Maintenance (O & M) Activities	• O & M organization to be set up by the project authorities/DoWR to disseminate operation and maintenance of irrigation system. • Effective water regulation and control should be exercised. • WUA/People's participation (PP) involvement of SHGs should be ensured for weeding, De-silting activities
3	Awareness Raising and Farmers Training	• O & M Budget to be finalized. • Farmers training and Dissemination of information should be ensured. • Dispute Resolution system should be developed by the Project Authorities to solve disparity of water supply in canals.

D] Other facilities:

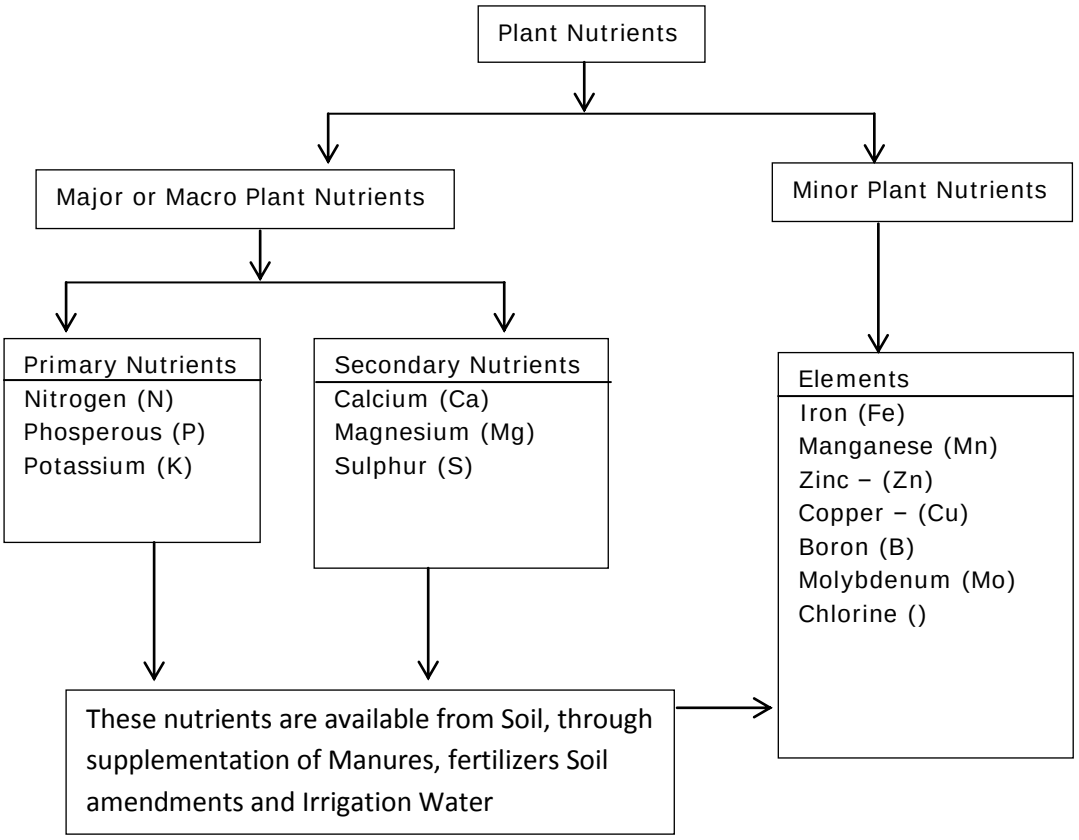
- Crop cutting and storage facility.
- Crop Trading facilities.
- Credit facilities for Agricultural Development.
  - The farmers of the command area would normally face problems in the above areas.

- Entry Point Activities (EPA) should be entrusted to organization for Baseline assessment and problem resolution suggestion.
- DoWR authorities should provide necessary support to the WUAs / Farmers.

7.4.0 Nutrient Management:

Nutrient Management Plays an important role in the irrigated agriculture scenario, basically plants require Carbon, Hydrogen and Oxygen which are available from air and water. But many other elements are required to be supplemented by the soils of the command area for proper growth and crop development.

Plant nutrients are classified as follows.



7.4.1 Removal of Major Nutrients by Different Crops:

The quantities of plant nutrients removed by different crops are not same. The major nutrients removals per quintal of different crops are indicated below.

Table No.C7-8: Major Nutrient Removal by Different Crops [Kg/Qntl]

Sl. No.	CEREALS				Pulses				OIL SEEDS			
	Major	N	P	K	Major	N	P	K	Major	N	P	K

	Crops		(P_2O_5)	(K_2O)	Crops		(P_2O_5)	(K_2O)	Crops		(P_2O_5)	(K_2O)
1.	Rice	2.01	1.12	3.00	Black gram	7.87	1.43	6.70	Ground Nut	5.81	1.96	3.01
2.	Wheat	2.45	0.86	3.28	Green gram	9.11	3.2	12.0	Mustard	3.28	1.64	4.18
3.	Maize	2.63	1.39	3.58	Peas lentil	8.50	2.76	10.40	Raya	6.45	2.06	5.34
4.	Sorghum	2.24	1.33	3.40	Chick pea	4.63	0.84	4.96	Soybean	7.07	3.09	5.77
5.	Barley	2.06	0.78	2.52	Pigeno Pea	6.38	1.77	4.23	Sun flower	6.33	1.91	12.62

Source: AGRONICA- By Directorate of Agriculture and Food Production, GoO

7.4.2 Soil Characteristics and Amendment Measures:

Soil Tests:

- Since quality of the command area soils regulates the nutrients supply capacity, there is imperative need for soil testing before selecting the cropping pattern.
- Soil tests at baseline conditions have been carried out. Some interpretations of soil testing results are shown below which determines the Soil type and crop cultivation methods.

Table No.C7-9: Interpretation of Soil Quality Tests

Sl. No.	Parameters	Range	Classification
1	pH	<6.5	Acidic Soil
		6.5 to 7.5	Neutral Soil
		>7.5	Alkaline Soil
2	Salinity	<1 ds m^{-1}	Normal
		1-2 ds m^{-1}	Critical
		>2 sd m^{-1}	Injurious
3	Organic Carbon	<0.5%	Low
		0.5 to 0.75%	Medium
		>0.75%	High
4	Available Nitrogen (Alkaline $KMnO_4$ method)	<250 kg/ha	Low
		250-500 kg/ha	Medium
		>500 kg/ha	High
5	Available Phosphorus (Bray's method)	<14 kg/ha	Low
		14-40 kg/ha	Medium
		>40 kg/ha	High

6	Available Potash (Ammonium Acetate extractable (K))	<128 kg/ha	Low
		128-280 kg/ha	Medium
		>280 kg/ha	High
7	Secondary & Micro Nutrients (Critical limit in ppm)	S=10, Zn=0.6 Fe=6, Mn=4 Cu=0.4 B=0.5 Mo=0.1	Standard Soil Characteristic

Source- AGRONICA Directorate of Agriculture & food Production Govt. of Odisha

Recommended Soil Amendment method for acidic Soils:

For amelioration of acidic soils 'liming' method has been recommended.

Liming materials may be any of

- Ground lime stone ($CaCo_3$) @ 100% neutralization.
- Quick lime (CaO) @ 179% neutralization.
- Paper mill sludge Ca (C_3HCo3) @ 75% neutralization.

7.4.3 Nutrient Management Methods:

- Nutrient depletion is anticipated due to intensive cropping activities in irrigated agriculture. Nutrient level management is necessary to restore/improve soil health interalia the soil environment.
- Nutrients may be supplemented through increased application of chemical fertilizers. But, due to the abrupt hike in the fertilizers price, it may be cost expensive and normally not acceptable to common farmers.
- The agriculture specialists have therefore recommended integrated use of plant nutrients comprising of chemical fertilizers, organic manure and green manure and Bio fertilizers for conservation of Soil health & Environment.

a) **Integrated Nutrient Management**:

Annual fertilizer consumption in Odisha is estimated to be nearly 2.5 lakh tones which is below the crop removal of 3.6 lakh tones. Thus there is a gap of 1.1 lakh tones which is unlikely to be bridged by increased cost on production of chemical fertilizers with rise in prices of raw materials and energy. Therefore integrated use of all the sources of plant nutrients is needed to check the nutrient depletion along with conservation of soil health and its environment.

Besides the chemical fertilizers the other sources of integrated nutrient supply include, organic manures, green manuring and bio-fertilizers. For sustainable agriculture the integrated nutrient management (INM) is proposed.

b) **Organic Manure**: Use of organics (FYM – Farm yard manure) is the oldest and most widely accepted protection of nutrient replenishment. The organic manure available in the village are inefficient and of poor quality. The quality can be improved through scientific process of composting.

c) **Green Manuring**: Green manuring is an effective process of nutrient recycling. Sesbania aculeate (Dhanicha) and sun hemp are the principal green manure crops in Odisha. The former is suitable for low and medium lands and the latter greens in uplands. Besides green manures looping of trees and shrubs may be adopted for supplementation of nitrogen.

d) **Bio Fertilizers**: Bio fertilizers are represented by bacteria, algaria and fungi. The bacteria may be symbiotic (Rhizobium) or non-symbiotic. They fix atmospheric nitrogen. Blue green algae can add 20 – 30 kg N/ha to the wetland rice.

Some research in the field of nutrition management has recorded that application of FYM at 5t/ha along with recommended dose of NPK fertilizer to irrigated rice cultivation system helped to maintain soil health and increased the yield by 12 to 15% over NPK application liming the acid soils along with application of recommended NPK dose increased the crop yields by 20 to 50 percent higher than NPK only. Similarly Dhanichas along with NPK increases the yield considerably.

7.5 Fertilizers Management:

Optimum use of fertilizers in opportune time of the crop periods is considered as most appropriate strategy for increasing the agricultural productivity. Such an approach not only fulfils the crop requirement but also protects the soil health.

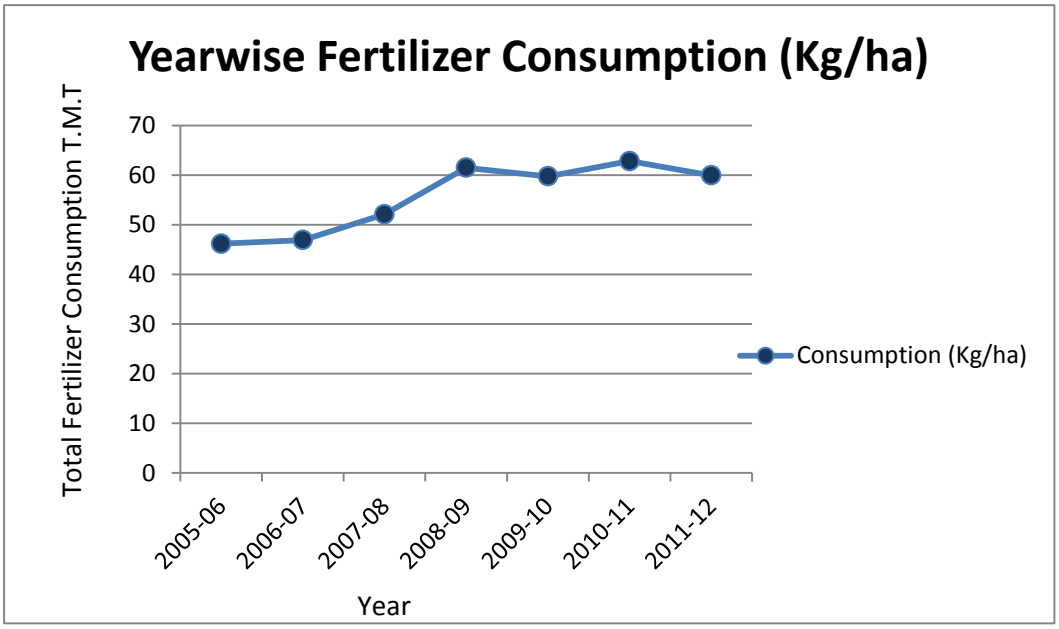
Fertilizers consumption in the state of Odisha has been showing an increasing trend from 294.88 TMT during 2005-06 to 514.69 TMT by 2011-12 at 74.59%, which is an indicator of rapid growth due to irrigated agriculture. The state scenario in fertilizers consumption is shown below.

Table No.C7-10: Fertilizers consumption at level (Odisha)

Year	Fertilizers consumption in 000 TMT				Consumption in Kg/ha
	N	P	K	Total	
2005-06	243.21	91.05	60.62	394.88	46.18

2006-07	256.54	92.77	53.57	402.88	46.92
2007-08	273.63	121.48	67.21	462.32	52.13
2008-09	297.77	147.93	89.17	534.87	61.50
2009-10	292.29	148.59	78.46	519.34	59.78
2010-11	294.72	153.97	89.16	537.85	62.85
2011-12	323.41	135.48	55.80	514.69	59.96

Source: Status of Agriculture in Odisha 2012-13 DOAFE Odisha



7.5.1 Comparison of fertilizers consumption rates by State of Odisha Vs. Some adjoining States in India:

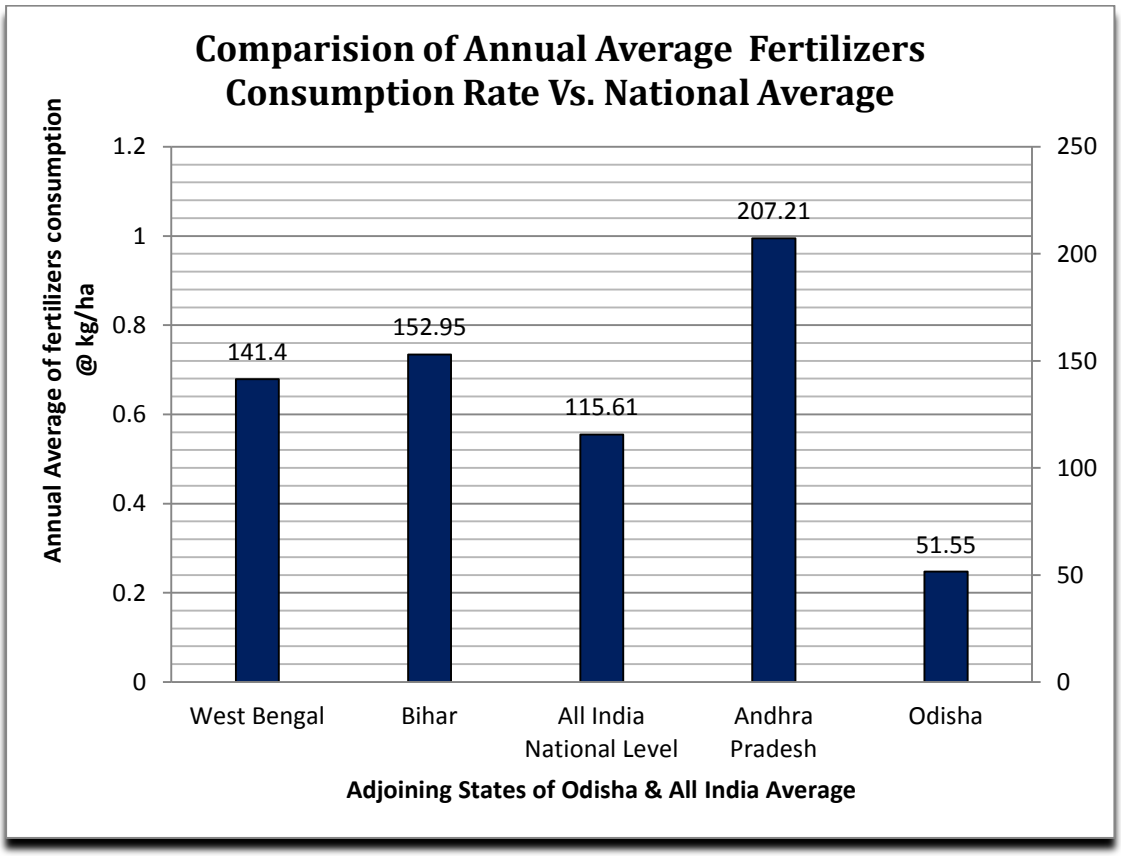
Table No.C7-11: Comparison of fertilizers consumption Rate @ kg/ha

Name of adjoining	Year wise Consumption Rate of fertilizers					Annual Average
	2005-06	2006-07	2007-08	2008-09	2009-10	

State						
West Bengal	127.50	143.21	144.21	157.69	-----	141.40
Bihar	125.32	144.72	162.81	178.98	----	152.95
Andhra Pradesh	203.61	185.91	199.64	239.71	----	207.21
Odisha	**46.18**	**46.92**	**52.13**	**61.50**	**62.85**	**51.55**
All India Average	104.50	112.30	117.07	128.58	----	115.61

Source: Odisha Agricultural Statistics 2009-10 by DOA & F Govt. of Odisha

The above comparative study in annual average consumption is shown in the graphical representation.



Analysis:

- In Comparison to the Agro–rich Andhra Pradesh 207.21 kg/ha Odisha's fertilizers use rate is 51.55 kg/ha which is only 24.87%.
- In comparison to all India Average, Odisha's fertilizers use rate is 44.58%.
- The above analysis poses concern for the Odisha's Agricultural Development Scenario.

- Govt. of Odisha contemplates considerable rise in fertilizers consumption by 2020, by including huge potential of irrigated agricultural through Rengali Irrigation Project.

7.5.2 Consumption of Chemical fertilizers in different blocks of the command area districts:

As against the fertilizers consumption rates analysed above for the State of Odisha and other adjoining States as well as the Status at State level, there is a need to assess the consumption rates in the different blocks of the command area under the three concerned districts, i.e. Dhenkanal, Jajpur & Keonjhar.

Table No. C7-12: Districts Wise & Block Wise assessment of Consumption of Chemical Fertilizers

Year of Assessment 2009-10

Name of Districts	Name of Blocks (LBC-II Phase-II)	Consumption of Fertilizers (000 MT)				Per Hectare consumption (kg/ha)	Districts Average (kg/ha)	State Average (kg/ha)
		N	P	K	Total			
Dhenkanal	Bhuban	0.76	0.34	0.23	1.33	42	35	51.55
	Kankadahada	0.70	0.32	0.20	1.22	40		
Jajpur	Sukinda	1.15	0.98	0.50	2.63	95	106	51.55
	Danagadi	0.98	0.93	0.40	2.31	145		
	Korai	1.88	1.44	0.71	4.03	131		
	Rasulpur	1.08	1.03	0.47	2.58	123		
Keonjhar	Ghasipura	0.52	0.28	0.07	0.87	31	28	51.55
	Anandpur	0.46	0.24	0.07	0.77	31	31	

Source: District Statistically Head Book 2009-10 by DoE & S Govt. of Odisha

Summary:

- The average per hectare consumption of fertilizers in Dhenkanal district is 41.00 Kg/ha which exceeds the district average by 17.14%. But compared to the state average of 51.55 kg/ha the district consumption rate is 32.10% less.
- The command area in Jajpur district is a part of Brahmani Delta where extensive agriculture is practiced. In Jajpur district the per hectare fertilizer consumption in four of the blocks of LBC Command area averages 123.50 Kg/ha. This is also higher than the district average by 16.10%. The district average @ 106.0 kg/ha is also higher than the state average by 105.62%
- In Keonjhar district, the block wise average is 31% which exceeds the districts average by 10.71%. But the district average (28 kg/ha) fall short of the State average by 45.68%.

Analysis:

In Dhenkanal and Keonjhar districts, the consumption rates of fertilizers are less than the State average while in Jajpur district the rate is excess of the State average.

7.5.3 Projected requirement of Chemical Fertilizers for Command of LBC-II Phase-II:

Sl. No.	Name of District	Command Area (in Ha)	Average Block wise fertilizer use rate(kg/ha)	Quantity of fertilizers requirements (MT)
1.	Dhenkanal	10,356	41	424,596
2.	Jajpur	46,600	123,50	5755.100
3.	Keonjhar	16,011	31	496.341
Total LBC-II Phase-II		72,967	----	6676.37

Say 6676 MT

Summary:

- At the present rate of fertilizer consumption (**Table No.C7-10**), the projected requirement of Chemical Fertilizers will be around 6676 Million Tonnes; for the project.
- Fertilizers application will be decided by the District Agriculture Officers (DAO) after conducting command area soil tests and assessment of Nutrient demand for a revised cropping pattern.
- The quantitative requirement of Nitrogenous, Phosphatic and potassic fertilizers out of the above gross requirement will be rationally spelled out by the DAO for each phase of crop cultivation i.e. for Khariff, Rabi summer and Perennial Crops.

7.5.4 Promotional activities / Programme Component:

1. Create awareness about the negative impacts connected to over use of chemical fertilizers.
2. Create awareness regarding the importance of soil testing and optimizing the fertilizer dosing. It is to be decided on the basis of agro-climatic zones, crops cultivated as well as seasonal influence.
3. Train the farmers on the method, dose and time of application of fertilizers.
4. Train the farmers on ratio of fertilizers to be used for a particular type of crop and also the time of its application.
5. Promote use of bio-fertilizers to avoid negative impacts caused due to excess use of chemical fertilizers.

6. Train the farmers about proper way of preparing Farm Yard Manure (FYM).

7.5.5 Action Plan:

- Test the soil samples in nearest laboratory, motivate the group of farmers for soil testing by providing support for collection, transportation and testing at subsidized rate. This will help in selection of proper fertilizer with proper dosing.
- Obtain necessary expert advice for selection of fertilizer dose and application schedule through agriculture extension officer.
- Extend necessary support for procurement of fertilizer at subsidized rate from Government programme.
- The ratio of chemical fertilizer and bio-fertilizer to be maintained.

7.6 PEST MANAGEMENT:

a. Impact of Pesticides: The major interest of this project is to ensure extra coverage of irrigation area. In the process farmers intending to boost up the crop production and to prevent pest attack may go for unscrupulous use of pesticides and insecticides which results in un-desirable effect on crop health as well as human health.

b. Integrated Pest Management Plan: Integrated pest management (IPM) is a collection of techniques to control agricultural pest including the use of pesticides when appropriate. IPM replaces use of some pesticides by bio-control agents and physical intervention so as to reduce the non-point source of water bodies by pesticides. IPM is knowledge intensive and requires extensive interaction amongst farmers within a region as well as in collaboration with govt. entities.

The services of the Line Departments such as Agriculture and Horticulture Departments would be used for promotion of IPM, which is one of the important components of watershed development program.

c. Promotion of IPM in Agriculture Command:

- Dissemination of knowledge to farming community emphasizing advantages of IPM.
- Improving farmer's awareness about the health hazards misuse and mishandling of Plant Protection Chemicals (PPC)

- Improving awareness through training for proper handling, usage, storage and proper disposal of containers of PPC.
- Increasing awareness about efficacy and advantages of eco-friendly alternatives of chemical pesticides.
- Promoting use of bio-pesticides (Neem based products)
- Training and demonstration related programs to the use of IPM techniques and practices
- Improving the information and knowledge on pests control methods.

d. Organic Farming & Bio-pesticide Use:

Wide propagation of organic farming includes:

- Experience based sharing workshops with successful organic farming demonstration
- Linkage with organizations working for promotion of organic farming
- Building market linkages for organically produced fruits, vegetables and food grains. This needs to be addressed as part of implementation strategy in a comprehensive manner.

e. Policy, Regulatory Framework and Institutional Capacity:

- The Government of India as well as the State Government is striving hard to discourage the use of hazardous PPC and to promote the use of environmental friendly techniques dovetailed with IPM as well as to encourage the use of botanicals, pheromones, bio-control agents and microbial pesticides.
- The Prevention of Food Adulteration (PFA) act is the policy tool which regulates the quality of food products manufactured, sold and consumed in India. Under this act, pesticides are noted contaminants and are defined as harmful to human health.
- World Bank Operational Policy OP.4.09 on pest management forms the background of implementing action.

f. Institutional Support and Capacity Building: There are many institutes that are involved with teaching, research and extension aspects of IPM program. The National Centre for Integrated Pest Management has a mandate to develop and promote IPM techniques for major crops to sustain higher crop yields with minimum adverse ecological implications. The Orissa University of Agriculture and Technology (OUAT), Krishi Vigyan Kendra (KVK), State agricultural farms, Central Rice Research Institute (CRRI),

NGOs and the training and orientation institutions are to be associated with. Besides, the state government provides expertise through well trained professionals under the Department of Agriculture and Horticulture who can also impart the training on IPM techniques.

7.7 WEED MANAGEMENT IN COMMAND AREA:

Weeds are the 'plants' growing in places where they are not desired. According to Weed Science Society of America (WSSA), the weeds are plants that are objectionable or interfere with activities and welfare of human society.

The efficiency of drainage system is reduced due to the growth of aquatic plants and ipomoea in water bodies. It is therefore necessary to develop a suitable strategy to control the development of weeds and ensure that its regeneration is checked considerably.

The following mitigating measures can be taken up for effective management.

a. **Manual Control**: In this method, labourers are deployed to cut the weeds by manual method using simple tools along the adjacent banks of the canal.

b. **Chemical Method:** This method is more effective than manual control. Herbicides are used in this method and considered as powerful tools in aquatic plant management. Herbicides are potentially more thorough and sometimes long lasting. This method can be applied effectively and safely with a solid understanding of the chemistry and biology of the ecosystem.

c. **Mechanical Control:** This indicates that the weeds can be controlled be mechanical means i.e. by using machineries. In such method the equipment is usually mounted on a boat or on a tractor that operates from the bank or from the shore. One of the mechanical methods is Dredging that not only harvests the plant material but also removes the underground material of rooted plants and seeds. This provides an important advantages over other mechanical methods, because removal of roots, rhizomes, and other plant propagates causes a delay in regeneration of the weed. Unfortunately, even dredging can leave enough plant propagates behind for subsequent quick growth.

d. **Biological control:** Biological control methods potentially provide better long-term success than mechanical or chemical methods. For aquatic weeds,

biological methods are based on the introduction of a herbivorous organism, fungus or virus into the affected ecosystem.

e. **Integrated control:** Integrated control refers to the application of combined physical, chemical, biological and environmental control methods, when single methods are unlikely to succeed or when longer-lasting control of weeds or algae is required at reduced costs and with fewer undesired side effects.

The project should ensure the importance of involving stakeholders while implementing this method where in a long term monitoring will be required. Integrated approaches should also consider the timing of the control action in relation to the life cycle stages of aquatic plants.

Aquatic weed control program should preferably be executed as part of an integrated water management program.

Aquatic weed may be predominant in canals as well as in few stagnant water bodies. This can be handled by manual control, chemical control and biological control.

f. **Use of aquatic weeds (soil amendment):** Aquatic plant material can be used for preparation of compost. These may be used to increase the organic and nutrient content, the microbial activity, and the texture of soils. After composting, this can be directly spread on the surface or mulched into the top layer of the soil. Mulching results in reduced evaporation, weed suppression, increased soil moisture and organic content, and reduced erosion. Procurement of chemical fertilizers will be limited to some extent by poor section of the people as the compost is used in the field. However, the required parameter of the soil is to be supplemented by the advice of Agro Experts after conducting the soil test. Otherwise, the aquatic weed removed from different locations shall be dumped in a pit. After decomposition of the bio-mass, these can be used as land up-gradation agent prior to land preparation and cultivation.

7.8 Management Plan – Water logging

- During the survey for baseline conditions of the command area, it is noticed that large areas exhibit high ground water table between 2.0m to 4.0m bgl during Monsoon Season (September/October). These areas showed

considerable low ground water elevations ranging from 5m to 9m bgl during the pre-monsoon period.

- Steady rise of ground water table during monsoon season, may affect command areas with water logging problems.
- Upon consultation of Depth to water level map of the command area (**Fig.No.C3-11)** about 75% to 80% of ayacut under Jajpur district, 50% to 60% area under Dhenkanal district and 30% to 40% area under Keonjhar district may develop water-logging conditions after introduction of Irrigation.

Reasons attributed to high ground water level:

i. The ayacut of LBC-II Phase-II remains in the deltaic region of two major river systems, Brahmani and Baitarani.
ii. Existence of high ground water table during monsoon season is endemic in this region. Upon enquiry; it is known that these areas never suffered with crop losses during Khariff cultivation.
iii. Adequacy of natural drainage plays an important role in these areas which becomes the reason for non-existence of severe water-logging. Mitigation measures comprising of surface drainage and subsurface drainage are suggested below.

7.8.1 Management of drainage in command area:

The command area generally experiences two common categories of drainage problems, namely

- Surface drainage problem
- Sub surface drainage problem

These two problems being the major indicators of water logging, this section deals with its mitigation measures.

- **Surface drainage**:
  - As mentioned earlier, the surface drainage problem may arise due to obstruction of natural streams & valley drains, and
  - Inadequate field drainage to release excess rainfall precipitations.

- **Sub surface drainage**:
  - Sub surface drainage problem may arise due to existence of impermeable layers.
  - Large areas of flat lands which tend to be poorly drained are because of the subsoil permeability and

- High ground water table occurs when the soil is rapidly permeable and exhibit gentle sloping.

7.8.1.1 Management of Surface Drainage:

a) Management of Natural Drains:

The left bank canal with its large number of distributaries i.e. Main Canal, Distributaries, Minors and sub-Minors meet many natural drains in their respective alignments.

To restore natural flow of these drains the project authorities have designed suitable cross drainage structures.

Table No.C7-13: Cross Drainage Structures Proposed In LBC-II Phase-II Canal System

Sl. No.	Descriptions of Canals	No.s	Length in kms	Numbers of CD structures proposed	Remarks
1.	Main Canal LBC	1	69.687 km	69	Include 2no.s Aqueducts
2.	Branch Canal	5	732.001 km	674	All drains of the ayacut considered
3.	Distributaries	5	108.947km		
4.	Minors & Sub Minors (Off taking from Main canal)	16	41.295km		
	Total CD works			743	

There is a budgetary provision of Rs 182.85 Crores in the project cost estimate to ensure safe stream Crossing.

During the Construction of structures across the small streams and drains, the following precautionary measures should be taken

- Avoid giving a temporary diversion to the drains
- Ensure that the construction debris (Solid Waste) are not thrown to the drains which may block the flow

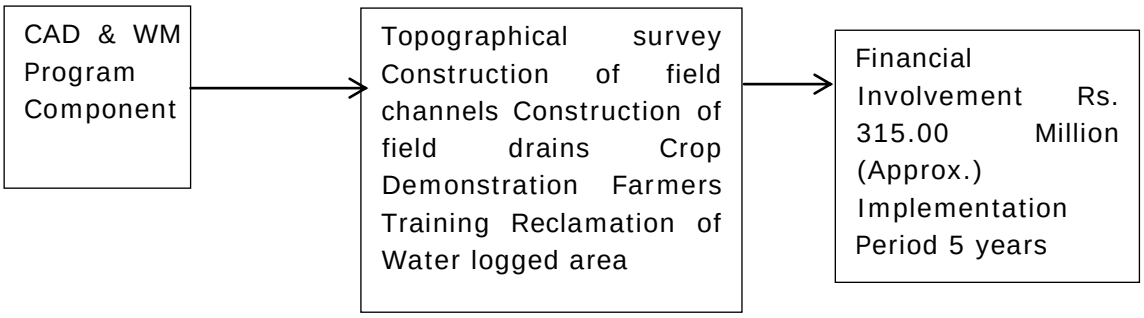
- Ensure that the oil and Grease generated from machinery & Equipment's are not led to the drainage.
- Regime section of the drains at the Crossing points should be maintained with additional protection (i.e. Pitching or lining)

b) Management of Field drainage:

In view of proposed large Scale agricultural intensification activities, the command area development works becomes imperative.

The project authorities/ Govt. of DoWR will entrust the command area development works to the CADA organization for taking up CAD and Water Management Program.

In the programme components of CAD & WM, the following activities are included



- In the fields drain work, there would be a number of Drainage channels with provision of suitable lining and hydraulic structures.
- The apprehended potential waterlogged areas measuring about 3800 hectares Approx. are proposed to be reclaimed @ Rs.15000/- per ha
- All these activities will be undertaken by CADA within a period of 5 years.

7.8.1.2 Management of drainage for storm events in the command area:

- The low land paddy (Khariff Season) grown in the flat lands in the monsoon Season and is dependent on Monsoon rainfall arising out of storms of sporadic events. The Monsoon Rainfall may sometimes get very heavy and may continue for 3 days or more duration.
- It is desirable to remove the volume of water collected in the paddy fields within the minimum possible time. As such a command area drainage planning will be meticulously charted out and implemented.

7.8.1.3 Approach to estimation of field discharge:

1) Factors influencing field drainage:

- Intensity of rainfall & Duration
- Soil Characteristics
- Vegetative cover and land use
- Size and topography of land
- Tolerance of crops to flooding

2) **Rainfall intensity :** Analysis of storm rainfall throughout the country indicates that,

- Duration of storm is taken as 3 days.
- Design of drain sections will pertain to 7 days duration for 5 years return period.

3) Selection of storm events :

- Study the Rainfall pattern for at least 5 years continuous period
- Sort out maximum period of precipitation which lasted for continuous 7 days duration.
- To record maximum storm events which occurred in the preceding 5 years

4) Methodology for Estimation of Field Discharge:

Amongst several imperical formulae devised for estimation of field flooding, the most appropriate method is prescribed by Water Management Division of Ministry of Agriculture (GoI) for this excess flooding condition.

- **Estimation by Using Runoff Equation:**

  The following Rainfall − Runoff equation may be adopted.

  $Q = (P-La)^2/(P-la)+S$

  [Ref: Theory and Design of Irrigation structures by R.S. Varshney & Gupta]

  Where Q= Depth of Runoff over the Catchment/watershed

  P= Depth of Rainfall

  La= Initial abstraction in equivalent depth

  S= Potential maximum retention of water by the soil and land cover

- In similar projects, the calculations of discharge worked out to be 0.076 Cumsec. (Ref: Brutang Irrigation Project)

- As per Bureau of Indian Standards [IS 8835-1978 Reaffirmed 1995], the above designed discharge worked out to be 0.162 Cumsec.
- As such, field drains should be designed for the maximum of 0.162 Cumsec

5) Design of Drain sections :

The design parameters field drains are given below.

Parameters	Formula	Reference
1. Velocity	V= 1/N $R^{2/3}S^{1/2}$ V= Velocity of flow (M/Sec) N= Rugosity Coefficient =0.025 for earthen sections R=A/P wetted Perimeter S= Bed Slope	Manning Formula
2. Side Slopes	1:1 in Cutting sections	IS 8835
3. Fixation of level at outlet point	EL should be above the drain's Maximum water level	--do--
4. Hydraulic Slope	Should not exceed 0.30 M in the entire length	IS 8835

7.8.1.4 Management of Subsurface Drainage:

Subsurface water level fluctuations may be due to factors like,

- Normal rainfall recharge/ rainfall infiltration
- Recharge due to seepage from unlined Canals
- Return flow from irrigation fields

In this LBC command area, the steady rise of ground water level is mainly contributed by Rainfall precipitation and subsequently ground infiltration method.

➢ The rainfall infiltration factor for area with high clay content 20% of Normal rainfall (Jajpur & Dhenkanal)
➢ For Weathered and Fractured hard rock areas (Keonjhar). 15% of Normal rainfall

Source: CGWB Publication 1997

7.8.1.5 Depletion of Ground water Table:

The enhanced ground water level may cause water-logging of the area when irrigation water is applied to the command area lands.

In those areas where severe water-logging conditions may arise, the ground water depletion technology is to be adopted. Pumping and recycling system may be adopted in each case.

7.8.1.6 Recommended method to prevent water-logging:

• Provide adequate Drainage • Prevention of structures leakages and Canal seepages • Conjunctive use of Ground Water	Use of surface drainage method as well as subsurface drainage methods. Maintain structures safety • Provide lining to the canals as far as practicable or maintain earthen sections. • Excess recharge to be withdrawn by Lift Pumps • Find out upland command for irrigation • Entrust works to State Ground water Directorate / lift Irrigation wing of the State Govt.

7.9 MANAGEMENT PLAN FOR HEALTH DELIVERY:

The increase in water fringe area provides suitable habitats for the growth of vectors of various diseases, which is likely to increase the incidence of water borne diseases.

A water resources project consists of various components and each requires a set of specific management measures.

a. Operation and maintenance

- Water management practices inherent in optimal agricultural practices should be introduced;
- Canals should be periodically cleared of weeds;
- Fish species consuming the mosquito larvae, i.e. Gambusia affinis and Bermuda are proposed to be introduced in the canals and stagnant water bodies in the command area.

b. Camping sites for workers

- The site selected for habitation of workers shall not be in the path of natural drainage.
- Adequate drainage system to dispose storm water from the labour colonies shall be provided.

c. Other Measures

- Adequate vaccination and immunization facilities shall be provided for workers at the construction site.
- The labour camps shall be at least 2 to 3 kms away from a main water body.

d. Water borne diseases

Various measures recommended for control of water borne diseases are given below.

- It is recommended that details of incidence of various water borne diseases in the command areas blocks be collected to detect any particular trend.
- A detailed water quality monitoring programme be designed and implemented. In areas showing incidence of water-borne diseases, intensive water quality monitoring need to be done.
- Adequate training at village level needs to be given. Drinking water must be regularly tested for the following tests;
- Orthotolodine tests for chlorine
- Lead Acetate paper test for bacterial infection.
- Development of sanitation facilities in the project area
- Disposal of solid waste and sewage from various sources at appropriate sites located at suitable distance from drinking water sources. The sites can be selected in consultation with the local administration
- Provision of onsite chlorination facilities at appropriate locations in the area.
- Provision of chlorine tablets to the population which cannot be served with chlorinated water.
- Regular monitoring and surveillance of drinking water.

e. Public Awareness Programme:

It is recommended that a detailed health awareness programme be implemented in the project and the surrounding areas. The objectives of the survey are to:

- Increase knowledge, awareness about various diseases and actions to be taken in the course of an epidemic.
- Develop community education messages to provide the community with information about recognizing the illness, how to prevent transmission and when to seek treatment.
- Initiate proper communication with the community as soon as epidemic or public health problem is identified.

As a part of the awareness programme, locals should be made aware of the following measures about various commonly prevalent diseases in the area.

- Signs and symptoms of the disease
- Feasible and cost-effective preventive measures
- When to come to the health facility for consultation and treatment
- Immunization recommendations, if any.

The message should be clear and concise in local language. Special care should be taken that sentiments and cultural beliefs of the target population are not hurt. The awareness programmes could use the following means of communication.

- Radio
- Television
- Newspaper
- Meeting with health personnel, community, religious and political leader.
- Posters
- Presentations at markets, health centers, schools, women's & other community groups, service organizations, religious centers.
- Select and use a community liaison or health staff to serve as spokesperson for interaction within media, and provide information related to the epidemics.

f. Health Extension Activities:

The health extension activities will have to be carried out in the villages situated within the study area. It is important to inculcate hygienic habits of

environmental sanitation especially with respect to water pollution by domestic wastes. There would be possibility of the transmission of communicable diseases due to migration of labour population from other areas at the construction site. It is proposed to strengthen the health institutions like community centers and primary health centers already available in these blocks. Medical facilities available in the command area blocks are furnished in the Chapter-5.

The doctors from the Hospitals and Health Centres may be organized to work as a part of the command area health system and the dispensaries in various command area will make regular visits to the villages and organize health promotional activities with the active participation of the local village leaders, NGOs and available local health functionaries. The health functionaries would undertake the following tasks as a part of health promotional activities;

- Collect water samples to ascertain the potability of water from different sources so as to monitor regular disinfection of drinking water source.
- Maintain close surveillance on incidence of communicable diseases in these villages.
- Maintain close liaison with the community leaders and health functionaries of different departments, so that they can be mobilized in case of an emergency.
- However, the Directorate of Health Services under Health Department is to be consulted for suggesting a conducive Health Management Plan with physical and financial propositions for implementation.

The frequency of monitoring could be once in 15 days. A special van needs to be provided for this purpose. In addition, larvae eating fish species, i.e. Gambusia affine and Bermuda need to be introduced in various water bodies, so as to control the mosquito growth.

7.9.1 Action Plan for Malaria Mitigation:

I. Purpose:

The purpose of the proposed action plan includes:

i. Strengthening of infrastructure facility

ii. To provide blood sample testing facilities in existing health institutions.

iii. To adopt integrated Vector control measures and mitigation of effects of malaria parasites.

iv. To heighten awareness amongst the community about prevention and early detection measures.

v. To entrance the capacity of malaria link volunteers (MLV) and community leaders as well as line department staff.

vi. To ensure supplementation activities extended through Malaria control Program (MCP) by Health Department of GoO.

II. Implementation Strategy:

- In the previous completed phase of LBC-II Phase-I, the malaria mitigation measures were entrusted to Chief District Medical Officer (CDMO) Dhenkanal at an estimated expenditure of 4.012 Million INR.

- In this continuing Phase i.e. LBC-II Phase-II the implementation of Malaria mitigation measures will be undertaken in close liaisoning with Health Department.

III. Monitoring :

- Monitoring of the Malaria Mitigation Activities was entrusted to the Voluntary Health Association of India (VHAI) New Delhi as handholding agency for state's Health Department in Phase-I. This aspect may be got examined by Project Level Environmental Monitoring Committee (PLEMC) DoWR and appropriate procedure will be decided.

7.9.1.1 Engineering Methods of Malaria Control:

Mosquito breeding is associated in poor Canal conditions in general. Mosquito breeding is contributed by

- Sluggish water flow
- Eroded Canal Banks
- Blockage by Vegetation growth

- Creation of seepage pools along canal sides.

The proposed Mitigation Measures:

Mitigation Measures comprises of

➢ Lining of the Canal Sections
➢ Straightening of Canal alignment as far as practicable
➢ Effective Canal maintenance to prevent seepage & growth of vegetation.
➢ Periodical Canal flushing
➢ Effective command area management through WUA's
➢ Building awareness amongst water users

Source: NK- WAPCOS Report 30th April 2011

7.9.1.2 Proposed Vector Control Measures:

Activities under this item include

➢ Identification of Mosquito breeding places through NGO's / WUA's
➢ Procurement of medicated Mosquito nets and Insecticides and distribution of the same.
➢ Construction of Hatcheries, Activation of Hatcheries by releasing Gambusia fish
➢ IEC activities comprising of information, education and communication (IEC) to the command area stakeholders
➢ Awareness meetings / Anti-malarial campaign.

Source: NK- WAPCOS Report 30th April 2011

7.9.1.3 Budgetary Provision:

- However, the proposed expenditure will be according to the MMM programme to be charted out by respective CDMO's of Jajpur & Keonjhar districts.
- MMM programme will form a part of the entire Health Delivery plan.

Improved health facilities being the primary responsibility of the Health and Family welfare Department of the state government, the project authorities will pursue for successful implementation of health delivery plan. The budgetary

requirement may be met from various fund allocations available by state and Health Ministry of Govt. of India including NRHM and other centrally sponsored schemes.

However, DoWR keeps a lump-sum expenditure provision in the project cost estimate towards support mechanism.

7.10 Management plan of Wildlife:

As schedule-I species is present in the project area, a separate **Wildlife Conservation Plan** has to be prepared.

7.11 Rehabilitation & Resettlement Plan (RRP):

The RRP will confirm to "Right to fair compensation and transparency in Land Acquisition, Rehabilitation & Resettlement Act (LARR Act 2013) duly published in GoI Gazette 31st Dec 2013.

The R&R entitlement and compensation package:

- The R&R entitlement of the RRP for all project affected families (including squatters) will be judiciously finalized by Rehabilitation & Resettlement committee to be constituted by the State Govt. (GoO).
- The compensation package with admissibility of items and monetary settlements will confirm to the provisions of the above mentioned LARR Act 2013.
- However, an illustrative R&R package is placed in the following **Table No. C7-14.**

Table No. C7-14: Sample R&R Package
(Package to families @ 2014 rate LA 5612 Acres Sec-31(1), 38(1) and 105(3) of LAR&R Act 2013)

	Item	Rate		No. of Families	Cost in INR
1	Constructed house	Like Indira Awas House @ 70,000/-	70,000	351	24,570,000.00
4(a)	Choice for Annuity for AF or	Rs. 2,000 × 12 month × 20 years with indexation		-	-
4(b)	Employment generation for AF or	for 1 member per family for 26,171 families		-	-
4(c)	One time payment	Rs. 500000 per family	500,000	351	175,500,000.00
5(a)	Subsistence grant per DF	Rs. 3000 /month × 12 months	36,000	198	7,128,000.00
5(b)	Subsistence grant per ST/SC DF(SC-18.2% + ST-25.4%)	Rs. 3000 /month × 12 months + 50,000/-	86,000	153	13,158,000.00
6	Transportation cost to DF	Rs. 50000 one time	50,000	351	17,550,000.00
7	Cattle shed/petty shops etc for AF (for those who will loose 50% or more than their full land) which may be considered as 5% of the AF	Not less than 25,000/- per family	25,000	1326	33,150,000.00
8	One time grant to Artisan, small trader or self-employed person or an affected family who owned non-agricultural land or commercial, industrial or institutional structure. 10% of DF	Minimum Rs.25,000/- per family	25,000	35	875,000.00
10	One time resettlement allowance	Rs.50,000 /-	50,000	351	17,550,000.00
11	Stamp duty & Registration fee.				
			Total		289,481,000.00
			or Say	Rs.	2,894.81 Lakh
				(Rs.	289.48 Million)

1 Make provision for generation of employment -26,171 families
2 One time payment - 351 families

CHAPTER-8
ENVIRONMENTAL MONITORING PROGRAMME

8.0 NECESSITY FOR ENVIRONMENTAL MONITORING:

Monitoring is an essential component of sustainable water resources development. At the same time monitoring process forms an integral part of all Environmental assessment activities. In view of the complexities and uncertainties involved in the proper evaluation of environmental impacts, environmental monitoring need to be carried out regularly in the post project scenario so that the project authorities would adhere to appropriate measures to maximize positive impacts and minimize the negative ones.

The results of Environmental monitoring of various parameters specified in the management plan are to be collated and analysed by Environmental experts to script out appropriate decisions for effective implementation. In the broader scenario the Environmental monitoring data as well as effectiveness of the mitigative measures will serve as a model for similar other water resources projects which may come up in future.

The table including entire ESMoP based on "guidelines for Environmental and Social considerations" is shown in Annexure No. XII (ESMP and ESMoP).

8.1 AREAS OF CONCERN:

Monitoring measures are required for the following phases of project cycle.

i. Monitoring during Construction phase
ii. Monitoring during operational phase

Various parameters and related activities for the above two phases are discussed in this section.

8.1.1 Areas of Concern during Construction Phase:

Variables to be Monitored	Activities involved	Monitoring period proposed / Authority
Water quality	Water quality for both surface and ground waters need to be monitored once in every month.	As per CPCB / SPCB norms
Air Quality	Review of Mitigation Measures	As per CPCB / SPCB norms

Noise level & Vibration	Review of Mitigation Measures	---do----
Environmental up gradation measures (labour Camps, Plantations etc.)	Review of Mitigation Measures for maintenance of labour camps and plantation progress etc.	As per CPCB / SPCB norms

- **Water Quality:**

  Prescribed monitoring measures are

  - Water quality tests to be conducted every month for identification of pollution parameters.
  - Ensure acceptable standards of water at all monitored stations.
  - Water quality of ground water especially at tunnelling location to be given more importance as because it becomes vulnerable due to drilling operations conducted beyond 8m below ground level.
  - PMU/Water Quality experts to suggest treatment measures.
  - Ensure conflict resolution between water users.

- **Air Quality:**
  - Review of mitigation measures suggested to maintain Air quality.
  - PMU to suggest corrective measures.

- **Noise levels & Vibration:**
  - Review of Mitigation Measures.
  - Enforce Environmental guidelines in the construction procedure.
  - PMU to ensure conflict resolution between village & executant, which arise during Tunnel boring Operation.

- **Environmental up-gradation Measures:**
  - Review of Mitigation Measures proposed for each of the activities like
    - Filling, levelling of construction areas & backfilling of burrow Areas.
    - Maintenance of temporary labour camps by executing agencies.
    - Malaria Mitigation Measures etc.
  - PMU to ensure timely delivery of health support to the labour force by co-ordinating the Public Health counters parts of the State Government.
  - Monitor, progress of plantation.

8.1.2 Areas of Concern during Operation Phase:

The variable proposed for monitoring is discussed below in the table.

Variables for Monitoring	Activities involved	Monitoring period proposed/Authority
Water Quality	To observe regularly the likely changes in the quality of surface and ground water	As per CPCB / SPCB norms
Changes in the ground water level	Observe water level in wells to ascertain status of ground water levels after irrigation.	Pre Monsoon & Post Monsoon
Water logging & Drainage	Identification of waterlogged areas and suggestion of treatment measures.	Monsoon
Optimized use of water in various sectors	Ensure efficient use of water for better water conservation.	During Rabi and Khariff season
Weed infestation in the water body	Observe, if there be any weeds in the reservoir & Canals	Post Monsoon period
Soil quality and use of Agro chemicals	Soil testing & review of fertilizers dosages recommended by DoA	During Rabi and Khariff season

8.1.2.1 Water quality:

[A] Water quality tests

- Water quality of surface water and ground water shall be monitored at regular interval.

- The frequency of monitoring is as per CPCB / SPCB norms.

- Ground water quality shall be tested after sampling from the same wells for which pre-project tests have already been carried out.

- Various use based parameters to be tested for both surface water and ground water samples are indicated below in tabular form.

Table No. C8-1: Monitoring format recommended for surface water quality tests

Monitoring Stations No…….

Sample Location: …… /Lat…… (N)/ Long……..(E)

Date of observation……. Time of observation……

Sample code……

Atmospheric Temperature……

Sl. No.	Parameter	Units	Results after lab testing	Remarks
1	Colour	Hazen Units		-
2	Odour	-		
3	Taste	-		
4	Turbidity	NTU		
5	pH	-		
6	Temperature	^{O}C		
7	Total Suspended Solids	mg/l		
8	Dissolved Oxygen	mg/l		
9	Conductivity	µmhos/cm		
10	Total Dissolved Solids	mg/l		
11	Total Hardness as $CaCO_3$	mg/l		
12	Chloride as Cl	mg/l		
13	Phosphate as PO_4	mg/l		
14	Nitrate as NO_3	mg/l		
15	Oil & Grease	mg/l		
16	Sulphate as SO_4	mg/l		
17	Chemical Oxygen Demand	mg/l		
18	Biological Oxygen Demand	mg/l		
19	Phenolic Compound	mg/l		
20	Fluoride as F	mg/l		
21	SAR	mg/l		
22	Boron as B	mg/l		
23	Iron as Fe	mg/l		
24	Total Coliform	MPN/ 100ml		
25	Faecal Coliform	MPN/ 100ml		-

Table No. C8-2: Monitoring format recommended for Ground water quality test

Station…….. Date of sampling…….

Well location….. Sample code……

Sl. No.	Parameter	Units	Standard as per IS:10500	Test result	Remarks
1.	Colour	Hazen Units	-		
2.	Odour	-	-		
3.	Taste	-	-		
4.	Turbidity	NTU	-		
5.	pH	-	6.5-8.5		
6.	Dissolved Oxygen	mg/l	6.0 (min)		
7.	Conductivity	µmhos /cm	-		
8.	Total Dissolved Solids	mg/l	500		
9.	Total Hardness as $CaCO_3$	mg/l	300		
10.	Nitrate as NO_3	mg/l	20		
11.	Chemical Oxygen Demand	mg/l	-		
12.	Biological Oxygen Demand	mg/l	2.0 (max)		
13.	Fluoride as F	mg/l	0.6-1.2		
14.	SAR	mg/l	-		
15.	Boron as B	mg/l	-		
16.	Iron as Fe	mg/l	-		

[B] Analysis of monitored water quality:

- The water quality data for each parameter, so obtained during the field survey are to be analysed with Tolerance Limits prescribed in the CPCB/OPCB guidelines.
- These are further to be compared with the water quality results already obtained in the pre-project scenario at the baseline study.

- Should there be variations beyond the prescribed limits, these are to be analysed by experts and remedial measures be suggested in view of drinking water supply.
- The PMU should suggest remedial measures against presence of any pollutants.

8.1.2.2 Changes in the Ground water level:

- After supply of irrigation water, the ground water table in certain areas may rise considerably. It may reach the zone of safe limit between 2m-4m bgl which if noticed would contribute to water logging phenomenon.
- It is therefore necessary to record the variation of ground water level in various locations in the post project scenario.
- Monitoring of ground water level thus would include activities, mentioned below:

Period for which monitoring to be conducted = 3years

Step-1	Measure the Ground water level in open wells which were identified earlier and data collected during the baseline study.
Step-2	The frequency of study should be month wise in the monsoon months and periodically in the non-monsoon season
Step-3.	The baseline data should be compared with the monitored data and results be analysed by environmental experts.
Step-4	Remedial measures be suggested against likely water logging and implemented in specific areas.

8.1.2.3 Water logging & Drainage: Period of Monitoring = 3 Years

Step-1	Identification of areas with high water table between 2-4 m below ground level causing risks of water logging.
Step-2	Examine effectiveness of drainage pattern at the areas prone to water logging.
Step-3.	Ensure implementation of Drainage improvement suggested for water logged areas.
Step-4	Check the water quality of drainage water against pest contamination.
Step-5	PMU to suggest appropriate remedial measures to reclaim the water logged areas such as ground water extraction & conjuctive use of ground water.

8.1.2.4 Aquatic weed control:

- It is already stated that, weed infestation in the canals are detrimental to smooth flow conditions and water quality determination.
- Spread of aquatic weeds therefore shall be controlled according to the weed management plan.
- In the post project monitoring period the following steps should be taken against adversities weeding impacts.

Period of monitoring= 3 years / non-monsoon season

Step-1	To identify weed species their types and gestation period
Step-2	To identify problematic areas
Step-3	To observe effectiveness of weed control measures, already suggested in weed management plan. Monitoring during Post monsoon period.
Step-4	Monitored data should be analysed by experts to suggest additional control measures if felt necessary.

8.1.2.5 Optimization of water use in command area:

- Irrigation water supply should be optimized in the command area according to crop water requirement.
- Any excess supply of water and excess field application may result into soil salinity detrimental to Crop output and may cause drainage congestion.
- The drainage system may be reviewed periodically.

Period of monitoring =3 years/ monsoon season

I	Identify areas under risks of water logging and soil salinity
Ii	Review status of implementation of drainage system as already planned in the management plan.
Iii	Review effectiveness of drainage system already installed/implemented.
Iv	Check the water quality of drainage water against likely excess use of fertilizers and pesticides so as to prevent source of pollution.

8.1.2.6 Soil Quality Tests and Use of Agrochemicals:

- Soil quality should be tested prior to crop cultivation and record of samples to be maintained.
- A sample format for test records is given below

Date and Time:

District and Blocks	Locations Details (Villages/plots & Owners)	Type of Crops adopted	Soil type	Available P_2O_5	Available K_2O	pH	TSS	Fertilizers dosages recommended

Source: Soil testing methods by US agency for International Development Mission to India

- Quantity of Agrochemicals used in the specific areas which are being monitored.
- Fix-up appropriate dosages of agrochemicals in deciding integrated fertilizers prescription after consulting the agriculture experts.
- Monitor changes in water quality due to extensive use of agrochemicals in the command area.
- Assess health status of farmers who have used agrochemical unscrupulously.
- Farmers training programmes to educate benefit of balanced use of chemical fertilizers and Bio fertilizers manures.

8.1.2.7 Wildlife Monitoring Plan:

- It is to be assessed about the habitat of wildlife (elephants), their movements, frequency of visit to villages, incidence of damage and the remedial measures to be considerably reduce the human-wild animal conflicts.

- The DoWR will deploy elephant trekkers, anti-depredation squad to overcome elephant-human conflict to the extent possible.

- The compensation package has been identified by the govt. which are being regularly paid by the DFOs.

8.1.2.8 Monitoring plan for social environment:

The PMU will arrange to deploy competent officers/ agencies for cluster of villages to regularly monitor the social status and record agricultural activities, crop production including financial status, health delivery, employment and infrastructure development etc during the operation phase.

Their report after compilation by PMU will be placed before the PLEMC to sort out constraint areas and decide appropriate strategy for social improvement.

8.2 ENVIRONMENTAL MONITORING STRATEGY:

The procedure for implementing Environmental Management Plan & Environmental Monitoring Programme will be suitably decided by project authority / DoWR.

EMP:

- EMP is an abbreviation of Environmental Management Plan, required for mitigating negative environmental impacts either of short term or long term duration. EMP suggested for long term environmental issues are to be meticulously scheduled by the project authority both physically & financially.
- Activities under EMP are supposed to be implemented by existing working divisions & through existing staffing pattern under it. In case this becomes insufficient, the project authority / DoWR may create new working divisions.

EMoP:

- EMoP is an abbreviation term for Environmental Monitoring Programme. Implementation of environmental Management Plan (EMP) need to be effective & sustainable only through close monitoring activities.
- EMoP has been prepared taking into consideration the mitigation measures, management plan both during construction phase as well as operation phase.
- EMoP will be implemented by the project authority by a designated team of technical personnel who are not involved in the implementation activities.

The project authority may entrust EMoP to one of the Superintending Engineers & Executive Engineer, Quality Control Division. Their responsibilities, method of monitoring both physical & financial should be charted out as per suggested under this chapter.

CHECK LIST FOR ESMoP: Some activities and connected mitigation measures along with monitoring period are reflected in the checklist confirmation vide **Annexure No. XII.**

PROJECT LEVEL ENVIRONMENTAL MANAGEMENT COMMITTEE (PLEMC):

- PLEMC has been constituted by the State Govt. to take vital decisions on environmental management & monitoring activities related to Rengali Irrigation Project. This committee comprises of 20 no.s of members from various discipline headed by the Chief Engg. & Basin Manager, Brahmani Left Basin and Member Secretary Odisha State Pollution Control Board and representatives from different departments of GoO.
- This committee has already convened 16 meetings till 2013 and have appraised monitored status to the State govt. This will continue to function till completion of Rengali Irrigation Project.

8.3 THE PROJECT LEVEL MANAGEMENT UNIT (PMU):

- The project authorities will arrange to entrust monitoring responsibilities to one of his Superintending Engineers preferably holding the quality control and monitoring division of the project under his control.
- A Project Level Management Unit (PMU) has been formed which is figured in page C4-10. It comprises of 2 numbers Divisions for Design, Monitoring, and Quality control.
- The monitored data and analytical results be discussed and remedial measures if any be charted out.
- Dissemination of modified procedure with the project beneficiaries through periodic training programmes. This would improve the environmental awareness.
- All decisions to be ratified by the PLEMC before implementation.

8.4 REVIEW OF MONITORING BY JICA:

The PMU will strengthen its monitoring unit to effectively monitor various environmental issues / activities both during construction & operation phases according to the monitoring format prescribed by JICA.

- The comprehensive format is furnished in **Annexure No. XVIII.**
- Monitored data / results to be filled in by project authorities and reports to be submitted periodically for JICA review.

8.5 ENVIRONMENTAL COST FOR MONITORING ACTIVITIES:

The project authorities will provide funds support to carry out monitoring activities effectively; during the construction phase (5 years period) as well as in the operation phase of the project.

The monitoring activities in the operation phase will be scrupulously carried out for 3 consecutive years after the project is implemented. It may be extended further should it appear necessary. The tentative cost involved is shown in the **Table No.C8-3**.

Table No.C8-3: Projected Expenditure for monitoring activities.

Sl. No.	Item	Estimated cost (Rupees in millions)	Period	Project Expenditure for monitoring activities
1	Monitoring of variables during construction phase	5.00	5 Years	Not provided
2	Monitoring of variables in the operation phase	7.00	3 Years	Not provided
	Total	**12.00**		

Note: This amount may be apportioned to X-Ecology & environment subhead of Project Cost Estimate.

The estimated amount may be enhanced as per the decision of Project Authority.

CHAPTER – 9
ENVIRONMENTAL COST AND ANALYSIS

9.0 GENERAL:

Sustainable development in irrigation sector involves harmonies integration of technical and environmental studies in the various phases of project implementation. It is thus logical that the expanses involved in the appraisal of environmental quality and in the preparation of management plans and monitoring activities should be met from the funds allocated for the project.

9.1 PROJECT COST – ESTIMATE (Revised – Feb. 2014)

Table No. C9-1: Abstract of Cost estimate of Rengali Irrigation Sub-project LBC-II Phase-II (RD 71.313 km to RD 141.00 km)

Sl. No.	Detailed subhead	Amount (Rs in Millions)
I	WORKS	
1	A- Preliminary	149.93
2	B-land	734.65
3	C-Works	--
4	D-regulator	2547.45
5	E-Fall	56.71
6	F-C.D. Works	445.05
7	G- Bridges	1906.64
8	H-Escape	70.00
9	K-Building	895.50
10	L1 Earthwork	3463.56
11	L2 Lining	574.46
12	L3 Service Road	277.35
13	L4 Tunnel	1496.75
14	M-Plantation	34.33
15	O-Miscellaneous	1630.07
16	P-Maintenance	194.77
17	Q-Special T & P	37.93
18	R-Communication	59.74
19	U-Distributary	6113.25
20	V-Water Course & Field Channel	439.79
21	W- Drainage	24.17
22	X-Ecology & Environment	50.00
23	Y-Losses on Stock	48.69
	Total I works	25256.19
II	ESTABLISHMENT (10%) of I works less B Land	2452.15

III	TOOLS & PLANTS @1% of I works	252.56
IV	RECEIPT AND RECOVERIES ON CAPITAL ACCOUNT	-38.69
	Total Direct Charges	
	Indirect Charges	
(A)	Capitalize value abetment of land revenue	36.73
(B)	Audit and Account charges	252.56
	Total	**28211.50**

Details of cost estimate & EIRR as in the DoWR cost estimate 2014 are furnished in **Annexure No. XIII** & **XIV**

9.2 ENVIRONMENT COST:

As such estimation of cost for implementation of the environmental management and monitoring plans becomes a priority approach in the Environmental assessment study. In the instant case, the environmental cost estimate is tentatively worked out on the activity wise rationale using cost apportioning methods.

Table No. C9-2: Environmental Cost Estimate

Sl. No.	Description of Environmental Issues	Budgetary Provision Vide Cost Estimate /Subhead Rs million	Apportioned Environmental Cost Rs million	Remark
1.	Environmental & Ecology:			
	i. Treatment of Areas: • Filling levelling and grading of construction areas. • Burrow area backfilling and levelling		0.50 (Ls)	Items to be included in the contractual Package
	ii. Environmental Safeguard measures in labour camps: • Supply of free fuel to the construction labourers in the temporary labour camps. • Providing sanitation and safe sewerage disposal methods in labour camps • Drinking water supply in labour Camp • Free medical check-up and health delivery in labour camps.		7.50 (Ls)	-do- -do- -do-

	iii. Management plan for potential waterlogged areas: iv. Weed Control Management		15.00 (Ls) 15.00 (Ls)	Project Authority Project Authority
	Total Item 1	**50.00**	**38.00**	**Chargeable to X-Env & Ecology**
2.	Plantation Programme: i. Canal Bank Plantation, Avenue & Green belt / Area plantation / Beautification of structure sites. ii. Compensatory afforestation & Eco-Tourism / Plantation [Deposit with Forest Authorities]	34.33 [M-Plantation] 64.60 Forest Diversion Proposal	43.58 64.60	Already deposited with the DFO Amount already deposited with the DFO along with the NPV Component
	Total Item 2	**98.93**	**108.18**	**M-Plantation**
3.	Conservation Plan for Ecology [Flora, Fauna & Biodiversity] i. Deposit with Forest Dept. [Rs. 2166 m for 141km] ii. Wild life Management [Construction of structures for Elephant crossing Passages] iii. Awareness Campaign iv. To prevent forest fire and over grazing (Watch & Ward for 3 yrs.)	1075.32	1075.32 0.15 (Ls) 0.75 (Ls)	As per the 16th Meeting of PLEMC June 2013 The amount already deposited with the Forest Authority Project Authority (DoWR)
	Total Item 3	**1075.32**	**1076.22**	**Chargeable to X-Env & Ecology**
4.	Ground Water Study i. Study of ground water fluctuations in the command area and processing plan for conjugative use (Deposit Component) ii. Awareness programme	0.5085 ---------	0.508 0.042(Ls.)	As per proposal by GWS & I Division DoWR (Vide report PLEMC 2013)
	Total Item 4	**0.5085**	**0.550**	**To be reviewed & Chargeable to O-Misc.**
5.	Health Delivery Plan for Command Area i. Malaria Mitigation Measures [Deposit Components to District Medical Officer Angul] ii. Strengthening of existing Health Delivery System (Deposit to Directorate of Health and family		10.88 (Ls) 9.00(Ls)	Lumpsum provision -d0-

	planning)			
	Total Item 5		**19.88 Ls**	**chargeable to O-Misc.**
6.	Command Area Management [As per CAD & WM Plan by CADA]		440.00 (Ls)	• Apportioned amount according to CAD Plan available for LBC-II Phase-I • CAD & WM Plan for LBC-II Phase-II command to be prepared.
	Total Item 6		**440.00 (Ls)**	
7.	Environmental Monitoring Activities by DoWR		12.00	• Apportioned and chargeable to X-Env & Eco • To be reviewed
	Total 1 to 7 =	**1224.7585**	**1695.13**	**138.40 % excess**

Total Environmental Cost = **Rs. 1695.13 Millions**

9.3 ANALYSIS OF COST FOR AMELIORATION OF ENVIRONMENT:

- The project Cost estimate prepared during Feb 2014 envisages total cost of project= Rs. 28211.50 Million **[Reference Para 9.1]**
- The Environmental cost Estimate WORK out in **Para 9.2** = Rs. 1695.13 Million
- The cost Proportion is 1695.13/28211.50 X 100 = 6.00 %

Comments:

- The Environmental Cost estimate has been worked out on the basis of estimated cost provision as well as amount deposited / likely to be deposited to various implementing organization.
- Since Environmental components could not be quantified at the planning stage, the provisions made are tentative. The amount may increase according to year wise escalation of Cost.
- Although Drainage, communication facilities and canal lining facilities contribute to environmental up-gradation measures, the relevant provisions have not been included while framing the Environmental cost estimates (2014).
- The present ratio of 5.957% for amelioration of Environment is agreeable according to MOEF standards (Which should be minimum 2% or above).

- However, the DoWR budget may have to be revised further to accommodate the expenditure on all environmental components including those left out subheads.

9.4 PHASING SCHEDULE:

Phasing of expenditure and schedule of implementation depends on funding assistance from JICA.

This will be worked out by the project authorities after obtaining final budgetary approvals from the Govt. of Odisha.

However the project authority has indicated implementation schedule has given in the following table.

Year of Implementation	Expenditure (Million INR)	Remarks
2011-13	11344.12	Already Incurred
2013-14	2308.00	Proposed
2014-15	1500.00	Proposed
2015-16	2500.00	Proposed
2016-17	2500.00	Proposed
2017-18	3000.00	Proposed
2018-19	3000.00	Proposed
2019-20	3250.00	Proposed
2020-21	3250.00	Proposed
2021-22	3500.00	Proposed
2022-23	2180.00	Proposed
2023-24	1223.53	Proposed
Total	**39555.65**	

Source: Revised checklist part I in DoWR Cost Estimate 2014

CHAPTER – 10
MEETING WITH STAKEHOLDERS

10.0 POLICY REQUIREMENT:

1) By JICA:

JICA's Environmental Social Management plan [ESMP] - 2010 for Category 'A' Projects takes into account the borrower's initiative to hold consultation meetings with the stake holders for obtaining informed views of the affected people and local Non-governmental organisations in regard of the findings of EIA study and Probable Mitigation measures contained therein. The feedback and opinions expressed in the above meetings / Discussions to be held at various stages of project implementation shall be recorded and documented as an indicator of project success.

2) By World Bank:

Compliance to the above requirement of public consultation is also specified in the World Bank operational policy guidelines [OP. 4.01] at item 14. It envisages that during the Environmental Assessment Process (EA) of Category "A" &"B" Projects; the Borrowers need consult the project-affected groups and local Non-Governmental Organizations (NGO's) about the Projects Environmental aspects and take their views into account.

For Category "A" Projects, the borrowers to consult these groups at least twice i.e.

I. Shortly after Environmental screening and after the Terms of Reference [ToR] for the EA are finalized, and
II. After the Draft EA Report is Prepared.

10.1 PURPOSE:

The purpose of SHM refers to a process by which the concerns of the local affected persons and others who have plausible stake in the Environmental impacts and other project activities get a chance to discuss and communicate their views & comments.

Public involvement in decision making of this irrigation project forms as an important agenda by the funding agency JICA on the grounds of ethics and pragmatism.

It is thus becomes imperative to encourage participation of various stakeholders Viz. Project Affected Population, Elected Representatives, Government Officials, Academics, Society, Organizations etc. in the public consultation meetings which urges the project proponent to discuss all EIA related issues to ensure sustainable environment integrated with the development scheme.

The concept of stakeholder's involvement in the planning process would not only recognise environment related local issues for timely resolution but also enhances quality of life in the rural areas by promoting service delivery efficiency.

In response to the requirement of JICA (Funding Agency) and in conformity with the Terms of Reference (ToR) spelled out during October 2013, the State Government (Borrowers) have organised a number of meetings with the local people/ stake holders at various stages of the project appraisal.

The action taken details are described in the following paragraphs.

10.2 PUBLIC CONSULTATION MEETINGS THROUGH GRAMA SABHA (BEFORE APPRAISAL):

The project authorities have organized public consultations through village committee (Gram Sabha) meetings to obtain comments and suggestions from the public regarding various Environmental issues of the project. Amongst many development aspects discussed in the agenda, consent for forest diversion proposal for Rengali Irrigation Project is one, which received priority consideration.

i) Gram Sabha (GS): Statue & Functions

In Indian System of governance the Grama Panchayat forms the lowest tier of self governance. The 73rd Amendment to the Constitution has envisaged that the Panchayat Raj Institutions should function as institutions of local self governance for the empowerment and development of the community. Grama Sabha is the general body meeting of the Grama Sasan composed of members as per the electoral roll in respect of the Grama i.e. Concerned village. The Gram Sabha thus an entity of Constitution is & legitimized statutory body which is empowered to take decision in multifaced development activities in the area.

ii) Objective (Purpose)

The main objective of introducing Grama Sabha is to decentralize planning and evaluation with people's participation at the grass root level to bring about sustainable development through good governance. It aims at maintaining transparency and intimacy between all walks of Social life and providing support

to Panchayat Raj Institutions in implementing various development programmes of the government.

iii) Regulatory status of G.S. in Odisha

Each of the Indian states has legislated its own panchayat Act for formation of Panchayati Raj Institution attempting to incorporate the central theme of Constitutional Amendment. Odisha Grama Panchayat Act, 1964 amended from time to time provides the constitution of Grama as a village or a group of contiguous village, assigning a name which shall be of one of the villages. The chair person of the Grama Panchayat is designated as Sarapancha and is an elected, individual responsible for coordinating with the Government for implementation of the resolved action plans. There is provision for at least two meetings of the Grama Sasan in a year called Grama Sabha, one in February and the other is June.

iv) Agenda of Grama Sabha

Amongst several issues which describe the GS functions, the following are the significant items.

a. To approve the selection of schemes, beneficiary identification and implementation of various development programmes,
    i. In the instant case; the Government proposal for implementing the Rengali Irrigation Project, LBC-II Phase-II forms the key issue in the agenda, for people's consideration and
    ii. Approval /Agreeability of the people for parting with the forest land, cutting of trees etc which forms the, major environmental issues of the project is urgently required at the initial stage (pre-project action) to support Forest Diversion proposal which is a statutory requirement of MoEF.
b. To Review annual programmes, consider people's consent for new proposals, seek clarifications through Mukhia/Sarpanch about schemes, income, expenditure distribution & utilization of resources.
c. To promote village level unity and harmony among all sections of the Rural Community and develop a sense of ownership.
d. To facilitate amicable settlement of disputes and improve communications between the people and Government.
e. To document all success stories, best practices and disseminate them among all stake holders for wider adoption.

v) Operational Mechanism of Grama Sabha (GS)

- Frequency of Grama Sabha meetings
  - At least 2 times in a year
  - Additional/Special meetings may be held if necessary
- Title and Name of presenter:
  - The Sarapanch of the local Grama Panchayat presides over the Grama Sabha meeting. For understanding critical issues in the agenda, the Sarpanch may invite local Government officials for presenting the matter before the Grama Sabha (The Government officials are not members of Grama Sabha)
- How to inform people to attend Grama Sabha:
  - Critical issues related to new development programme are to be appraised to the collector /Block Development officer who may request the Sarpanch to convene special Grama Sabha meeting.
  - The Sarpanch convenes the Grama Sabha meeting. Notice comprising of venue date and time is issued at least 15 days ahead of the schedule. Copies given to the BDO and special invitees (Stakeholders/Government officials)
  - Notice is displayed on conspious places like Notice Board of high School, ME School, Primary School, Mahila Samiti, Yuvak Sangha, Anganwadi Centre, Panchayat office and office of BDO.
  - Information is also conveyed to the public by landspeaker announcement in each ward and by beating of drum in the weekly hat.
- Reporting mechanism: The proceedings of the meetings duly signed by members & others present is sent to the BDO for on ward action.

10.2.1 Grama Sabha Meetings held (Between October 2012 and November 2013) where diversion of forest land and consent for project implementation were considered.

Village level committee meetings (Grama Sabha Meetings) in 132 locations could be held within a period between October 2012 and November 2013.

Those meetings were attended by the villagers of the region as well as representatives of DoWR (Engineers) and local forest and revenue representatives.

Amongst various items of their agenda; Consent for parting with the forest land and implementation of Rengali Left Bank canal subproject LBC-II Phase-II was discussed. The representatives have responded to clarify doubts and queries.
The list of such Grama Sabha meetings are furnished in **Table No. C10-1**.

Table No. C10-1: Public Consultation (Gram Sabha) held during the Project Screening Period 2012–13

Sl. No.	Period		Venue				Attended by	
	Date	Time	Village	G.P	Tehsil	District	Villagers	NGO's & Other
1.	05.10.12	2pm	Amurtia	Amurtia	Vyasa Nagar	Jajpur	145	Representative
2.	03.10.12	9am	Jhatiasahi	Amurtia	Vyasa Nagar	Jajpur	32	-do-
3.	08.10.12	9am	Shalada	Mulapal	Vyasa Nagar	Jajpur	65	-do-
4.	11.10.12	9am	Dhanitri	Mulapal	Vyasa Nagar	Jajpur	61	-do-
5.	04.10.12	9am	Karada	Karada	Vyasa Nagar	Jajpur	206	-do-
6.	11.10.12	9am	Palasa	Karada	Vyasa Nagar	Jajpur	69	-do-
7.	05.10.12	9am	Ranigada	Karada	Vyasa Nagar	Jajpur	122	-do-
8.	06.10.12	9am	Bartamana	Karada	Vyasa Nagar	Jajpur	91	-do-
9.	08.10.12	9am	Bhakandari	Karada	Vyasa Nagar	Jajpur	96	-do-
10.	02.10.12	9am	Gobargali	Tulati	Vyasa Nagar	Jajpur	35	-do-
11.	05.10.12	9am	Tulati	Tulati	Vyasa Nagar	Jajpur	199	-do-
12.	09.10.12	9am	Khaira	Tulati	Vyasa Nagar	Jajpur	69	-do-
13.	09.10.12	2pm	Nigadha	Tulati	Vyasa Nagar	Jajpur	47	-do-
14.	06.10.12	9am	Mahulia	Ranapur	Vyasa Nagar	Jajpur	110	-do-
15.	04.10.12	9am	Bandala	Bandala	Vyasa Nagar	Jajpur	239	-do-
16.	06.10.12	9am	Baliapala	Bandala	Vyasa Nagar	Jajpur	54	-do-
17.	08.10.12	9am	Panasua	Taharpur	Vyasa Nagar	Jajpur	47	-do-
18.	05.10.12	2pm	Taharpur	Taharpur	Vyasa Nagar	Jajpur	43	-do-
19.	04.10.12	2pm	Santarapur	Taharpur	Vyasa Nagar	Jajpur	128	-do-
20.	08.10.12	9am	Nuapatna	Khamana	Vyasa Nagar	Jajpur	41	-do-
21.	05.10.12	9am	Naudapur	Khamana	Vyasa Nagar	Jajpur	136	-do-
22.	06.10.12	9am	Bansipur	Gourapur	Vyasa Nagar	Jajpur	41	-do-
23.	08.10.12	2pm	Jugalkana	Gourapur	Vyasa Nagar	Jajpur	76	-do-
24.	08.10.12	2pm	UttarKate	Barundei	Vyasa Nagar	Jajpur	11	-do-
25.	09.10.12	9am	Santasahi	Barundei	Vyasa Nagar	Jajpur	77	-do-
26.	05.10.12	9am	Jhanakana	Jhana	Vyasa Nagar	Jajpur	96	-do-
27.	06.10.12	9am	Jalugaon	Jhana	Vyasa Nagar	Jajpur	81	-do-
28.	08.10.12	9am	Taluri	Jhana	Vyasa Nagar	Jajpur	31	-do-
29.	11.10.12	9am	Narapada	Jhana	Vyasa Nagar	Jajpur	51	-do-
30.	04.10.12	9am	Mrutunjaypur	Dhaneswar	Vyasa Nagar	Jajpur	183	-do-
31.	05.10.12	9am	Aladajalasorpur	Dhaneswar	Vyasa Nagar	Jajpur	116	-do-

32.	08.10.12	9am	Sanapatuli	Dhaneswar	Vyasa Nagar	Jajpur	58	-do-
33.	09.10.12	2pm	Beguma	Dhaneswar	Vyasa Nagar	Jajpur	56	-do-
34.	06.10.12	10am	Mukindapur	Mukindapur	Vyasa Nagar	Jajpur	219	-do-
35.	09.10.12	9am	Tajpur	Panikoili	Vyasa Nagar	Jajpur	64	-do-
36.	02.10.12	9am	Altira	Panikoili	Vyasa Nagar	Jajpur	164	-do-
37.	02.10.12	2pm	Bantala	Sadakpur	Vyasa Nagar	Jajpur	79	-do-
38.	05.10.12	9am	Kharajabatira	Sadakpur	Vyasa Nagar	Jajpur	138	-do-
39.	09.10.12	9am	Barada	Sadakpur	Vyasa Nagar	Jajpur	122	-do-
40.	04.10.12	9am	Karabandi	Andheri	Vyasa Nagar	Jajpur	122	-do-
41.	05.10.12	9am	Ragadi	Andheri	Vyasa Nagar	Jajpur	76	-do-
42.	06.10.12	9am	Kiapada	Andheri	Vyasa Nagar	Jajpur	93	-do-
43.	06.10.12	2pm	Nuagada	Talagad	Vyasa Nagar	Jajpur	42	-do-
44.	08.10.12	2pm	Upergada	Talagad	Vyasa Nagar	Jajpur	61	-do-
45.	03.10.12	9am	Pataranga	Talagad	Vyasa Nagar	Jajpur	114	-do-
46.	04.10.12	9am	gohiragadia	Talagad	Vyasa Nagar	Jajpur	99	-do-
47.	04.10.12	2pm	Ashokjhara	Talagad	Vyasa Nagar	Jajpur	63	-do-
48.	05.10.12	9am	Naguan	Talagad	Vyasa Nagar	Jajpur	52	-do-
49.	09.10.12	2pm	Mandapada	Talagad	Vyasa Nagar	Jajpur	39	-do-
50.	03.10.12	10am	Soti	Goleipur	Vyasa Nagar	Jajpur	154	-do-
51.	10.10.12	2pm	Khandarapur	Goleipur	Vyasa Nagar	Jajpur	47	-do-
52.	04.10.12	2pm	Gujendrapur	Kantor	Vyasa Nagar	Jajpur	63	-do-
53.	05.10.12	9am	Kantor	Kantor	Vyasa Nagar	Jajpur	90	-do-
54.	08.10.12	2pm	Sahagun	Kantor	Vyasa Nagar	Jajpur	62	-do-
55.	08.10.12	9am	Purbakot	Kantor	Vyasa Nagar	Jajpur	65	-do-
56.	09.10.12	9am	Kainya	Kantor	Vyasa Nagar	Jajpur	78	-do-
57.	11.10.12	9am	Asangadia	Kantor	Vyasa Nagar	Jajpur	45	-do-
58.	02.10.12	11am	Salianga	Salianga	Vyasa Nagar	Jajpur	270	-do-
59.	03.10.12	11am	Balungabandi	Danagadi	Danagadi	Jajpur	122	-do-
60.	09.10.12	11am	Kantipur	Ollal	Danagadi	Jajpur	106	-do-
61.	04.10.12	11am	Telibada	Bangerkata	Danagadi	Jajpur	60	-do-
62.	09.10.12	11am	Nandakisorpur	Ranipada	Danagadi	Jajpur	86	-do-
63.	02.10.12	11am	Mulasor	Ranipada	Danagadi	Jajpur	132	-do-
64.	11.10.12	11am	Chitri	Chitri	Danagadi	Jajpur	294	-do-
65.	06.10.12	11am	Kharadi	Trijanga	Danagadi	Jajpur	158	-do-
66.	02.10.12	9am	Pachicot	Pachicot	Vyasa Nagar	Jajpur	122	-do-

67.	06.10.12	9am	Khamigaon	Pachicot	Vyasa Nagar	Jajpur	69	-do-
68.	09.10.12	9am	Manjuri	Pachicot	Vyasa Nagar	Jajpur	22	-do-
69.	02.10.12	10am	Nadiabhanga	Nadiabhanga	Danagadi	Jajpur	282	-do-
70.	02.10.12	10am	Haripur	Alati	Vyasa Nagar	Jajpur	40	-do-
71.	03.10.12	10am	Belasundari	Alati	Vyasa Nagar	Jajpur	26	-do-
72.	06.10.12	10am	Balarampur	Balarampur	Ghasipur	Keonjhar	196	-do-
73.	09.10.12	10am	Maluagada		Ghasipur	Keonjhar	110	-do-
74.	06.10.12	10am	Mathakhokasa		Ghasipur	Keonjhar	67	-do-
75.	03.10.12	10am	Baruan	Baruan	Ghasipur	Keonjhar	140	-do-
76.	02.10.12	10am	Machhalo	Machhalo	Ghasipur	Keonjhar	243	-do-
77.	03.10.12	9am	Bilabandha	Purambandhi	Ghasipur	Keonjhar	117	-do-
78.	05.10.12	10am	Kansargoda		Ghasipur	Keonjhar	98	-do-
79.	10.10.12	11am	Sulia	Ranagundi	Danagadi	Jajpur	91	-do-
80.	04.10.12	11am	Rampilo	Ollal	Danagadi	Jajpur	201	-do-
81.	02.10.12	10am	Gohira	Gohira		Kenojhar	176	-do-
82.	11.10.12	10am	Odisha		Bhuban	Dhenkanal	371	-do-
83.	13.12.12	10am	Odisha(Barmali)		Bhuban	Dhenkanal	26	-do-
84.	06.10.12	11am	Ranagundi	Ranagundi	Danagadi	Jajpur	185	-do-
85.	06.10.12	10am	Jarailo		Danagadi	Jajpur	120	-do-
86.	06.10.12	11am	Diapala	Bangarcota	Danagadi	Jajpur	74	-do-
87.	09.10.12	11am	Ragada	Ranagundi	Danagadi	Jajpur	111	-do-
88.	04.10.12		Chaumunhi	Balarampur	Ghasipur	Keonjhar	224	-do-
89.	05.10.12	10am	Jhadakundi	Balarampur	Ghasipur	Keonjhar	153	-do-
90.	04.10.12	10am	Kainipura	Balarampur	Ghasipur	Keonjhar	206	-do-
91.	05.10.12	3pm	Naduan	Balarampur	Ghasipur	Keonjhar	226	-do-
92.	05.10.12	9am	Baranga	Ganpura	Ghasipur	Keonjhar	217	-do-
93.	10.10.12	9am	Nandabara	Purunabandha	Ghasipur	Keonjhar	143	-do-
94.	02.10.12	9am	Gadabandhagoda		Ghasipur	Keonjhar	203	-do-
95.	03.10.12	9am	Madanpur	Madanpur	Ghasipur	Keonjhar	106	-do-
96.	06.10.12	9am	Kanpur	Madanpur	Ghasipur	Keonjhar	107	-do-
97.	10.10.12	9am	Satatora	Madanpur	Ghasipur	Keonjhar	196	-do-
98.	11.10.12	9am	Hasanpur	Madanpur	Ghasipur	Keonjhar	118	-do-
99.	04.10.12	11am	Belabahali	Belabahali	Anandapur	Keonjhar	254	-do-
100.	03.10.12	9am	Raghupur	Asanajhara		Jajpur	54	-do-
101.	18.10.12	10am	Anurtia		Vyasa Nagar	Jajpur	400	-do-

102.	18.10.12	9am	Mulapal		Vyasa Nagar	Jajpur	425	-do-
103.	18.10.12	9am	Karada		Vyasa Nagar	Jajpur	360	-do-
104.	18.10.12		Tulati		Vyasa Nagar	Jajpur	398	-do-
105.	17.10.12	9am	Ranapur		Vyasa Nagar	Jajpur	214	-do-
106.	18.10.12	10am	Bandalo		Vyasa Nagar	Jajpur	394	-do-
107.	18.10.12	10am	Taharpur		Vyasa Nagar	Jajpur	510	-do-
108.	18.10.12	9am	Khanana		Vyasa Nagar	Jajpur	389	-do-
109.	18.10.12	9am	Gourpur		Vyasa Nagar	Jajpur	426	-do-
110.	18.10.12	10am	Barundei		Vyasa Nagar	Jajpur	630	-do-
111.	18.10.12	10.30am	Jhana		Vyasa Nagar	Jajpur	447	-do-
112.	18.10.12	10am	Dhenswar		Vyasa Nagar	Jajpur	128	-do-
113.	18.10.12	10am	Makundapur		Vyasa Nagar	Jajpur	198	-do-
114.	18.10.12	11am	Panikoili		Vyasa Nagar	Jajpur	162	-do-
115.	18.10.12		Sadakpur		Vyasa Nagar	Jajpur	609	-do-
116.	17.10.12	9am	Andhari		Vyasa Nagar	Jajpur	473	-do-
117.	18.10.12	10am	Talagada		Vyasa Nagar	Jajpur	160	-do-
118.	18.10.12	10am	Guleipur		Vyasa Nagar	Jajpur	527	-do-
119.	18.10.12	10am	Kantore		Vyasa Nagar	Jajpur	165	-do-
120.	18.10.12	11am	shaliunga		Danagadi	Jajpur	525	-do-
121.	18.10.12	11am	Jakhapura		Danagadi	Jajpur	355	-do-
122.	18.10.12	11am	Ollala		Danagadi	Jajpur	281	-do-
123.	17.10.12	11am	Ranipada		Vyasa Nagar	Jajpur	405	-do-
124.	18.10.12	11am	Chitri		Danagadi	Jajpur	332	-do-
125.	18.10.12	11am	Trijanga		Danagadi	Jajpur	685	-do-
126.	18.10.12	9am	Pachicoat		Vyasa Nagar	Jajpur	525	-do-
127.	18.10.12		Asanjhar		Vyasa Nagar	Jajpur	313	-do-
128.	17.10.12	11am	Nadiabhanga		Danagadi	Jajpur	463	-do-
129.	17.10.12	11am	Ranagundi		Danagadi	Jajpur	318	-do-
130.	18.10.12	11am	Ranagundi		Danagadi	Jajpur	331	-do-
131.	18.10.12	9am	Andhari		Vyasa Nagar	Jajpur	481	-do-
132.	17.10.12	11am	Bangarcota		Danagadi	Jajpur	292	-do-

Reference: DoWR Records

Findings:

I. In the above mentioned public consultation (Gram sabha) meetings, programme & progress of various development issues were discussed.

II. Diversion of forest land being a critical environmental issue views of the people were sought for.

III. Although views of the public expressed in Grama Sabha meeting forms & pre-requisite of MoEF for considering forest Diversion proposal. The state government also desired to road the initial response of people for implementation of RIP. LBC-II Phase-II.

IV. People have unanimously consented for parting with the parts of forest land within their respective territories for the construction activities of Rengali Irrigation Project.

V. It implies that the public have conceptually agreed for quick implementation of the proposed Rengali Irrigation Project pending discussion of other environment issues in the subsequent period.

VI. An extract of the "Grama Sabha" proceeding is appended in **Annexure No.XV** as a confirmatory Sample.

Public Reponses:

In almost all meetings the village committee have welcomed the Rengali Irrigation Project (upcoming LBC-II Phase-II) and expressed No Objection for acquisition of forest land.

10.2.2 Stake Holder Meetings (SHM) upon Preparations of Draft EIA Report (November 2013)

During the EIA process and at a time when the Draft report has taken a shape, the project authorities have organised seven such meetings with the Stake holders between 11th November 2013 and 30th January 2014. JICA's expert team, EIA and Socio – economic consultants apart from the convenor, i.e. DoWR officials having project link along with other representatives from line departments have attended meetings held on 22nd November 2013. Minutes of the meeting appended in **Annexure No. XVI**.

Table No. C10-2: Summary of SHM's on 22.11.2013

Sl.	Period		Location			Participation
	Date	Time	Village	Tehsil / Block	Dist.	
1	10.11.2013	11.30 AM	Chitri	Danagadi	Jajpur	23 persons participated AFs 19
2	12.11.2013	11.30 AM	Nuapada	Ghasipura	Keonjhar	26 persons participated
3	13.11.2013	11.30 AM	Kiapada	Vyasa Nagar	Jajpur	30 persons attended
4	22.11.2013	11.30 AM to 1.30 PM	Khamigaon	Pachhikot	Jajpur	107 persons attended
5	22.11.2013	3.30 PM to 5.00 PM	Panchikot	Pachhikot	Jajpur	100 persons attended
6	30.01.2014	11.00 AM	Patranga	Korei	Jajpur	20 persons attended AF 20
7	30.01.2014	12.30 PM	Bara Biruan	Korei	Jajpur	24 M + 5F = 29 persons attended AF=20

Table No. C10-3: Issues raised by Public and Compliance furnished by DoWR

Sl. No.	Village Name	Issues raised by Public	Compliance to that issues
1.	Chiti	Wanted to know as to how the irrigated lands which are located at higher level of canal will get irrigation water	Explained by DoWR personnel: • Most ayacut will receive flow irrigation from canal • Land which are located at higher elevation will be irrigated by Lift process
2.	Nuapada	Wanted to know	Explained by DoWR personnel:

		• "How many people will get the irrigation benefit due to the canal system" • What is the amount of compensation to be paid to land owners	• Some people in the ayacut will be directly benefited by irrigation and some will be indirectly benefited. • Land Compensation will be paid as per prevailing provision under Govt. norm (LA Act 1894)
3.	Kiapada	Wanted to know as to • How much time it will take to complete canal works • How much compensation will be paid to the land owners	Explain by DoWR personnel: • Compensation will first be paid to the land owners as per availability of funds and then construction work will be taken up • Payment of compensation will be effected as per prevailing Govt. rate
4.	Khamigaon	• The rate of compensation is same for different types of land • There will be flow of water every day	• The Zonal Officer, in charge of land acquisition explained the process of valuation, and told that the rates will be different for different types of land. The compensation will be paid as per LAA1894 and Odisha RR Policy 2006. In future when the Act and Policy are revised compensation will be paid as per the then prevailing laws. • The EE explained that canal water will not flow all days in the year. There will be a period for

			kharif (rainy season) crops followed by a stoppage of flow after harvesting of kharif crop (during the period when water is not needed) for maintenance. Then water will be released in the canal for the Rabi (winter) crop.
		• We need water mostly for Rabi crops and accordingly water should be made available. Will polluted water come in the canals?	• Water would be released for Rabi crops, and polluted water will not come in the canals.
		• Affected people will be trained on different skills to support livelihood supporting activities?	• Yes, training programs will be conducted by government for skill up-gradation of affected people based on the type of livelihood supporting activities they would prefer.
5.	Panchhikot	• How many villages in Pachhikote *Gram Panchayat** will be affected where people will lose land?	• The details are available in EE office and with his staff who are touring in the affected villages. Any person who is interested can ask for the information from my staff or can get it from my

		• Some villagers want to know if their land is going to be affected or not	office (EE asked the people to note his mobile telephone number for future communication.) • EE said that he will give the information when villagers will give the particulars of the plot number, etc. (The Assistant Engineer gave his mobile phone number to the person).
6.	Patranga	People wanted to know as to how many years will be required to complete the canal works	Explanation by DoWR Personnel: Canal works will be started soon after concluding JICA's loan agreement and fund availability. The canal works is scheduled to be completed in 5 years time.
7.	Barabiruan	People wanted confirmation that whether the canal works will be taken up at all and if so, when the construction will be started	Explanation by DoWR personnel: • Canal works will be started after availing JICA's funding assistance • It is schedule to be implemented very soon

The proceedings of the meetings are appended in **Annexure No**. **XVI** in which the compliances given by the project proponents are furnished.

Photographs during Stake Holders Meeting are furnished below.



Stake Holders Meeting at Pachhikot



Stake Holders Meeting at Khamigaon

10.2.3 Programme for Future SHMs

In course of the implementation formalities of LBC-II Phase-II, and funding decision, the project authorities have programmed to hold Public consultations / SHM at 53 locations appearing in the command area.

The programme component and tentative schedule of SHMs are furnished below in **Table No**. **C10-4**.

Table No. C10-4: Locations for Stake Holders' Meetings in Ayacut area of LBC-II Phase-II

Sl. No.	Name of the Village	No. of affected persons
1	Nuagaon	103
2	Barigaon	119
3	Nachhipura	105
4	Badapatuli	168
5	Raghabpur	100
6	Bhakandri	140
7	Jarada	98
8	Jhatiasahi	143
9	Uchhabali	136
10	Uttarkot	198
11	Salijanga	205
12	Kainpura	94
13	Belabahali	149
14	Mukundapur	119
15	Laxminagar	103
16	Madanpur	127
17	Amrutia	171
18	Tigiria	98
19	Khalana	258
20	Padanpur	145
21	Pandua	117
22	Korabandi	112
23	Chandama	145
24	Kanpur	124
25	Talagarh	197

26	Karada	131
27	Bhaganai	103
28	Nahuranipokhari	80
29	Machhalo	127
30	Bhusal	333
31	Natakatabhuban	261
32	Odisha	221
33	Samal	179
34	Anal	88
35	Dhalapada	215
36	Kuninda	85
37	Ambasara	193
38	Atta	286
39	Analajhari	135
40	Karadapal	204
41	Mrudang	255
42	Nimapali	139
43	Nizigarh	127
44	Jamunananda	152
45	Kuhika	68
46	Hatisila	94
47	Sailang	205
48	Benapur	81
49	Sanapadna	107
50	Sainkul	298
Total No. of affected persons		**8275**

Schedule of Conducting Stake Holders' meeting

Month	No. of SHM to be conducted
1. January 2014	5 Nos.
2. February 2014	5 Nos.
3. March 2014	10 Nos.
4. April 2014	12 Nos.

Discussion:

From the SHMs already held by the project authorities, the stake holders are unanimous in their approach that

- LBC-II Phase-II of Rengali Irrigation Project should be implemented as early as possible.
- The farmers are encouraged by the agricultural achievements already exhibited by earlier phase (LBC-II Phase-I) funded by JICA.
- Stake holder's commitments are significant in their consent for active participation in all of those environmental impact mitigation measures & management plans.

CHAPTER – 11
DISCLOSURE OF EIA

FORMALISATION OF EIA REPORT

This EIA Report will be considered for confirmation by the Government of Odisha. Upon confirmation, the Department of Water Resources, Government of Odisha will send this Report to JICA, for further action concerning placement in their web site as suggested by the JICA Mission during their visit in December 2013.

In conformity with the JICA guidelines on Environmental and Social Considerations of Aril 2010, the EIA Report will be made available in the office of the DoWR, Chief Engineer and Basin Manager, Rengali Left basin, Sukinda (the Project executing agency) and the concerned Superintending Engineers and Executive Engineers for perusal by Project stakeholders and general public who would be permitted to take copies of the Report if they desire.

Annexure No. I

Telegram : PARYAVARAN
NEW DELHI

2011/7/96-IA-I

Telephone : 4360704
Telex : Bilingual) : W-66185 DOE-IN
FAX : 4360678

GOVERNMENT OF INDIA
MINISTRY OF ENVIRIONMENT & FOREST
PARYAVARAN BHAVAN, C.G.O. COMPLEX
LODHI ROAD, NEW DELHI - 110003

4.12.96

Subject :- Rengali Irrigation project stage - II (Construction of Left Bank (30-141 km) and right bank (0-112 kms) canals and a barrage) - Environmental clearance reg.

Water Resources Department, Government of Orissa, may refer to their letter No. 13234 dated 17.4.96 and subsequent letters, dated 17th May 1996, and 12th November 1996 on the subject..

2. The Ministry of Environment and Forests has carefully considered your application. It is observed that the proposal is for construction of a barrage across Brahmani river at Samal which is 34 kms. down stream from Rengali and two main canals (i.e. left main canal and right main canal) along with their tributaries for development of irrigation facilities in a CCA of 2,35,500 hec. Left bank canal starts from the Samal barrage on the left side of Brahmani river and ends near Baitarini river at Anandpur after passing through Angul, Dhenkanal, Athagarh and Keonjhar divisions. Right bank canal starts from the right side of the barrage which moves down & reaches Jenapada after passing Angul, Dhenkanal and Athagarh forest divisions.

The Project envisages providing irrigation to a culturable command area of 1,14,300 hec. on the side of left bank canal and 1,21,20 hec. on right bank canal. Brahmani river which dries during summer, after completion of the project will receive 1,500 cusec of water through out the year.

3. The Ministry of Environment & Forests hereby accords environmental clearance as per Environmental Impact Assessment Notification, 1994 subject to the strict compliance of the terms and conditions mentioned below : -

i. Adequate free fuel arrangement should be made to the labour force engaged in the construction work on project cost.

ii. Catchment Area Treatment plan should be strictly implemented with creation of necessary infrastructure facilities.

iii. Restoration of construction area should be ensured by levelling, filling up of borrow-pits, land scaping etc. The area should be properly afforested with suitable plantation.

iv. For protection of wild life and its habitat in the project impact area, the detailed action plan which is indicated in the "Conservation & management of wild life report should be strictly followed.

v. Kapilash along with other adjoining forest blocks should be declared as wild life Sanctuary immediately, by the State Government. Funds required for this purpose will be made available by the project authority. The forest department should provide protection to vegetation at Anantpur R. F, which is in a degraded state so that the vegetation cover is allowed to regenerate. An amount of Rs. 150 lakh will be made available for the development of Satkosia and Hadparh Wild-life Sanctuaries. The money should be used for development of these two sanctuaries keeping in view that animals do not migrate and intrude on farm land, which they do at present.

vi. For Monitoring of the conservation and wild life action plan a representative of the Wild Life institute of India, Dehradun and a representative of this Ministry may be included in the monitoring committee. Ministry will nominate its representative from Expert committee/Ministry Officials. The expenditure on wild life management may be reviewed by these members to ensure the best possible use of funds for protection of the environment/wild life.

vii. Priority should be given to provide land in lieu of land to the project affected persons. Local NGOs should be associated along with State Revenue Department and the oustees, to identify land for distribution. If NGOs and oustees feel that land is available but the project authority is not in favour of alloting it, then the NGOs concerned and the oustees could refer this to the Ministry/Expert Committee. A statement in this regard may be submitted to the Ministry within six months.

viii. The minimum depth of ground water is 2.5 mt. in some blocks. Introduction of Surface irrigation may result in increasing ground water table leading to water logging conditions. Project authority should prepare Command area development plan with drainage components. Necessary drainage and cross-drainage work should be strictly implemented with time bound targets.

ix. Health plan should be strictly implemented as proposed in the "Modified report on health measures for command area of Rengali irrigation project"

x. Financial provisions should be made in the total budget of the project for implementation of suggested safeguard measures.

xi. A multi-disciplinary committee should be constituted with representatives from various disciplines to oversea effective implementation of the suggested safeguard measures.

xii. Six monthly monitoring reports should be submitted to the Ministry and its Regional Office for review.

xiii. Forestry clearance for diversion of Forest Land (2159.43 ha.) under *Forest (Conservation) Act, 1980 has to be obtained separately by* Project authorities before starting any work.

3. Officials from Regional Office, Bhubaneswar, MOEF, who would be monitoring the implementation of environmental safeguard should be given full co-operation, facilities and documents/data by project proponents during their inspection.

4. The responsibility of implementation of environmental safeguards, rests fully with the State Department/Project Authorities and they should ensure co-operation of the Central and State Government.

5. Any change in the scope of the project will require a fresh appraisal.

6. The Ministry reserves the right to add additional safeguard measures subsequently, if found, necessary and to take action including revoking of the clearance under the provisions of the Environment (Protection) Act, 1986 to ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.

Sd/-
(Dr. S. Bhowmik)
Additional Director (S)

Dr. B. P. Das
Engineer-in-Chief
Water Resources
Secha Sadan
Unit - 5, Keshari Nagar,
Bhubaneswar - 751 001.
Orissa.

Annexure No. II

Telegram : "WELFARE"
Telex : 66256 MSW-IN
Fax : 384918

GOVERNMENT OF INDIA
MINISTRY OF WELFARE

Shastri Bhavan
New Delhi - 110 001

NO. 2011/5/96-TDB

Date 18/06/1996

To

Dr. B. P. Das,
Engineer-in-Chief
Department of Water Resources,
Government of Orissa,
Secha Sadan, Bhubaneswar.

Sub : Rengali Irrigation Sub-Project, LBC-II regarding clearance.

Ref : Your letter no. RL - 29/95/15070, dated 13.05.1996 and BP-EA 5/9 - 10527 dated 13.06.1996.

Sir,

As per the information furnished under your letters cited above, it is seen that only 10 tribal families are affected by the project. Considering the almost insignificant number of tribal families affected, it is informed that this Ministry has no objection to this project.

Yours faithfully

Sd/-
(H. S. BALLATH)
DIRECTOR

Annexure No. III

Telegram: PARYAVARAN
NEW DELHI

No. 8-53/96-FC

Telephone : 4360704
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GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT & FOREST
PARYAVARAN BHAVAN, C.G.O. COMPLEX
LODHI ROAD, NEW DELHI - 110003

Dated the 21st November, 1996.

To

The Secretary
Forest Department
Government of Orissa
Bhubaneswar.

Subject : Diversion of 2159.43 ha. of forest land for construction of Rengali Irrigation Project in Angul, Cuttack, Dhenkanal and Keonjhar districts of Orissa.

Sir,

I am directed to refer to your letter no. 10 F (con.) 55/96-9492/F&F dated 26.04.1996 on the above mentioned subject seeking prior approval of the Central Government in accordance with section of the Forest (Conservation) Act, 1980.

2. After careful consideration of the proposal of the State Government, the Central Government hereby approves in principle the diversion of 2107 ha. of forest land (details in the schedule) for construction of Rengali Irrigation Project (Barrage and Canal Systems) in Angul, Cuttack, Dhenkanal and Keonjhar districts of Orissa subject to the fulfillment of following conditions:-

i. Immediate action should be taken for transfer and mutation of equivalent non-forest land in favour of the State Forest Department.

ii. The user agency will transfer the cost of compensatory afforestation (revised as on date to incorporate existing wage structure) in favour of the Forest Department.

iii. Funds for compensatory afforestation will be provided for afforestation/rehabilitation of an area equivalent to forest area proposed to be diverted in addition to the land offered for compensatory afforestation. This area will be utilised for the purposes of irrigated plantations for which free water will be provided. The State doesn't have such a programme at present. Certain areas will be identified for eco-tourism and will be developed as such.

iv. The Advisory Committee recommends the proposal for approval for diversion of (2159.43 ha - 52.03 ha) = 2107 ha. forst land.

v. The project will provide crossing points for wild elephants wherever necessary after consultation with forest officers at local level.

SCHEDULE:

Break-up of forest land diverted for non-forestry use by legal status.

Sl. No.	Name of Forest Division	(Hectares) RF	PF	Khesra Forest	Village Forest	Total
1.	Angul	-	0.287	14.475	87.822	102.58
2.	Dhenkanal	242.54	29.33	249.76	256.18	777.81
3.	Athagarh	177.62	5.64	--	260.61	443.83
4.	Keonjhar	51.77	0.51	--	730.86	783.14
		471.93	35.767	264.235	1335.472	2107.36

or 2107 ha. (say)

3. After receipt of compliance report on the fulfillment of the above conditions from the State Government, formal approval will be issued in this regard under Section -2 of the Forest (Conservation) Act, 1980. Transfer of forest land to user agency should not be effected by the State Government till formal order approving diversion of forest land are issued by the Central Government.

Yours faithfully,

Sd/-
(D. C. KHANDURI)
Sr. Asstt., Inspector General of Forests

Copy to :-

1. Principal Chief Conservator of Forests, Government of Orissa, Bhubaneswar.
2. Nodal Officer, Office of PCCF, Govt. of Orissa, Bhubaneswar.
3. The CCF (Central) Regional Office, Bhubaneswar.
4. The AIG RO (HQ) New Delhi.
5. Guard file.

Sd/-
(D. C. KHANDURI)
Sr. Asstt., Inspector General of Forests

Annexure No. IV

F.No.8-53/96-FC (Pt.)
Government of India
Ministry of Environment & Forests
(F.C. Division)

Paryavaran Bhawan, CGO Complex,
Lodi Road, New Delhi-110003.

To,

The Secretary (Forests),
Government of Orissa,
Bhubaneswar.

New Delhi, the 13th May, 2003.

Sub: Diversion of 2159.43 ha. (2107 ha.) of forest land for construction of Rengali Irrigation Project in Angul, Cuttack, Dhenkanal and Keonjhar Districts of Orissa – Split up proposal for 812 ha.(Phase-I) thereof.

Sir,

I am directed to refer to your letter No. 10F(Cons.)55/96-9[illegible] dated 26[illegible] on the subject mentioned above seeking prior approval of the Central Government under Section 2 of Forest (Conservation) Act, 1980 and to say that the proposal has been examined by the Advisory Committee constituted by the Central Government under Section 3 of the aforesaid Act.

After careful consideration of the proposal of the State Government and on the basis of the recommendation of the above mentioned Advisory Committee, the Central Government hereby conveys its approval under Section 2 of the Forest (Conservation) Act, 1980 for diversion of 812 ha. (Phase-I) of forest land for construction of Rengali Irrigation Project in Angul, Cuttack, Dhenkanal and Keonjhar Districts of Orissa, subject to fulfillment of following conditions:

1. Legal status of the forest shall remain unchanged.
2. Compensatory afforestation shall be raised over equivalent non forest land and shall be maintained at the project cost.
3. Demarcation of the area will be done on ground at project cost using four feet high RCC pillars with serial numbers, forward and back bearings and distance from pillar to pillar.
4. The non-forest land transferred to the Forest Department for compensatory afforestation shall be declared as 'Reserved Forest' under Indian Forest Act, 1927.
5. Trees shall be felled only when it becomes necessary and under strict supervision of State Forest Department.
6. Reservoir so created shall be declared as 'Reserved Forest' under Indian Forest Act, 1927 with regulated fishing rights.
7. Irrigated plantations shall be raised and maintained at the project cost.
8. Areas identified for eco-tourism will be developed at the project cost.
9. Crossing points for wild elephants will be provided in consultation with the State Forest Department at the project cost.
10. Canal bank plantation shall be raised in consultation with the State Forest Department at the project cost.

11. No tree felling in the area between FRL and 4 m below FRL shall be carried out.
12. Water will be provided free of cost to the Forest Department for raising nursery/plantations in nearby areas.
13. Catchment area treatment plan shall be implemented under the supervision of State Forest Department.
14. Resettlement and rehabilitation plan for the displaced people shall be implemented immediately by the State Government.
15. No labour camps shall be established on the forest land.
16. Sufficient firewood depot should be opened after procuring firewood from Orissa Forest Development Corporation (OFDC).
17. The User Agency shall ensure that there should be no damage to the available wildlife.
18. The approval under the Forest (Conservation) Act, 1980 is subject to the clearance under the Environment (Protection) Act, 1986, if required.
19. The forest land shall not be used for any purpose other than that specified in the proposal.
20. The action initiated against erring officials and the prosecution of those officials must be completed by October, 2003. All other officers and agencies those who are yet to be identified, shall be identified as erring officials and agencies by RCCF, Bhubaneswar, who shall advice State Government to initiate action against them by 31st October, 2003, and complete the task by 31-3-2004. RCCF Bhubaneswar, will quarterly review compliance/progress of this condition.
21. Any other condition that the State Government as well as CCF (Central Regional Office, Bhubaneswar, may impose from time to time for the protection and improvement of flora and fauna in the forest area.

Yours faithfully,

Sd/---

(ANURAG BAJPAI)
Asstt. Inspector General of Fore

Copy to:-

1. The Principal Chief Conservator of Forests, Government of Orissa, Bhubaneswar.
2. The Chief Conservator of Forests (Central), Regional Office(EZ), Bhubaneswar.
3. The Nodal Officer, Forest Department, Government of Orissa, Bhubaneswar.
4. User Agency.
5. PA to IGF(FC).
6. File No.6-53/96-FC - Main File
7. Guard file.

14/5/03

(ANURAG BAJPAI)
Asstt. Inspector General of Fo

Annexure No. V

No. 16/27/96-PA (N) / 937-990 Dt. 24/06/96

GOVERNMENT OF INDIA
CENTRAL WATER COMMISSION
PROJECT APPRAISAL (NORTH) DIRECTORATE

407, SEWA BHAVAN,
R. K. PURAM, NEW DELHI - 66
FAX : 91-11-6875516

Sub: 65th meeting of Advisory Committee on Irrigation, Flood Control and Multipurpose Projects held on 14/06/96.

Sir, Find enclosed a copy of the Summary Record of discussions of the above mentioned meeting for information and necessary action please.

Encl as :

Sd/-
(SC CHITKARA)
CE, PAO &
Member Secretary
Advisory Committee

Copy to :

LETTERS OF COMMITTEE

1. Dr. M. S. Reddy, Secretary, Ministry of Water Resources, S. S. Bhawan, New Delhi.
2. Shri Ramesh Chandra, Chairman, CWC
3. Secretary (Expenditure), Ministry of Finance, North Block, New Delhi.
4. Secretary, Department of Power, S.S. Bhawan, New Delhi.
5. Secretary, Ministry of Environment & Forests, Paryavaran Bhawan, CGO complex, New Delhi.
6. Secretary, Department of Agriculture & Cooperation, Krishi Bhawan, New Delhi.
7. Secretary, Ministry of Welfare, Room No. 604, A-Wing, Shastri Bhawan, New Delhi.

8. Director General, ICAR, Krishi Bhawan, New Delhi.

9. Chairman, CEA, Sewa Bhawan, R. K. Puram, New Delhi.

10. Adviser (I & CAD), Planning Commission, Yojana Bhawan, New Delhi.

11. Adviser (Energy), Planning Commission, Yojana Bhawan, New Delhi.

12. Kanwal Nath, Financial Adviser, Ministry of Water Resources, S. S. Bhawa New Delhi.

13. Chairman, Central Ground Water Board, NH-IV, CGO New Comple Faridabad - 121001

Copy also to :

1. Member (D& R), CWC.

2. Z. Hasan, Member (WP & P), CWC.

3. G. R. Keskar, Member (RM), CWC.

4. K. C. Aggarwal, Commissioner (Projects), Ministry of Water Resources, S. S Bhawan, New Delhi.

5. Commissioner (PP), Ministry of Water Resources, S. S. Bhawan, New Delhi.

6. Commissioner (Indus), Ministry of Water Resources, CGO Complex, Lodhi Road, New Delhi.

7. Commissioner (ER), Ministry of Water Resources, CGO Complex, Lodhi Road, New Delhi.

8. S. L. Pahuja, Chief Engineer (PPO), CWC.

9. K. C. Manchanda, Chief Engineer (PMO), CWC.

10. V. K. Mathur, Chief Engineer (UGB), CWC, Jal Tarang Bhawan Pratap Bagh, Aliganj, Lucknow - 226020.

11. Director (Project Appraisal - North), CWC

12. Director (Project Appraisal - Central), CWC

13. Director (Project Appraisal - South), CWC

14. K. N. Keshri, Director (PPO N & S), CWC.

15. R. K. Khanna, Director (PPO), CWC.

16. M. Ganeshan, Director (ECO), CWC.

17. R. S. Goel, Director (EM) & (EIA), CWC.

18. O. P. Khanda, Director (M & A), CWC, Jal Tarang Bhawan, Pratap Bagh, Alignaj, Lucknow - 226020.

State Government Officers : Andhra Pradesh

1. P. K. Aggrawal, Secretary (Irrigation), Government of Secretarial, Hyderbad, (AP).

2. G. Prabhakar, Dy. Chief Engineer, irrigation Department Errum Manzil, Hyderbad, (AP) - 500 487.

3. Ch. Venkateswara Rao, Superintending Engineer, Irrigation Construction Circle, Kurnook, (AP) - 518 005.

4. Y. Abdul Basheer, Executive Engineer (I & CAD), Kurnool.

Orissa

1. Dr. B. P. Das, Engineer-in-Chief (Water Resources), Bhubaneswar (Orissa) - 400180.

2. K. C. Panda, Executive Engineer, Government of Orissa, NDSE - II, - 110 049.

Rajasthan

1. A. S. Kapoor, chairman, IGNB, Bhwani Singh road, Jaipur - 302 005.

2. S. P. sharma, Chief engineer, IGNP, Canal Colony, Bikaner 331 002.

3. R. P. Mathur, Assistant Engineer, Lift Irrigation Division, Kota, Rajasthan.

4. P. D. Mahanandani, Superintending Engineer, IGNP, Bikanaer 334 002.

5. S. N. Mathur, Po, IGNB, Bhwani Singh Road, Jaipur

6. N. K. Aggrawal, Assistant Engineer, IGNP, Canal Colony, Bikaner - 331 002.

UTTAR PRADESH

1. Rajiv Kumar, Superintending Engineer, ICC, DA - 7, Dhukwan Colony, Civil Lines, Jhansi - 284001.

2. Mahendra Singh, Assistant Engineer, ICD, Da - 4, Dhukwan Colony, civil Lines, Jhansi - 284001.

Copy forwarded for information to :

1. J. Sinha, Consultant (PF-I), Dept. of Expenditure.

2. Dr. S. C. Verma, Jt. Director, Ministry of Environment & Forest.

3. M. K. Sahu, Jt. Project Director, department of Agriculture & Cooperation, Crops Division.

4. K. C. Jain, Dy. Director, CEA.

5. Dr. A. N. Bhowmick, Member, CGWB

6. Hemant Kumar, Dy. Adviser (I & CAD), Planning Commission.

7. A. S. Gupta, Dy. Adviser (I & CAD), Planning Commission.

8. B. B. Srivastava, Jt. Commissioner (I), MOWR.

SUMMARY RECORD OF DISCUSSION OF THE 65TH MEETING OF ADVISORY COMMITTEE ON IRRIGATION, FLOOD CONTROL AND MULTIPURPOSE PROJECTS HELD ON 14/06/96 AT 11.00 HRS. IN THE COMMITTEE ROOM OF CENTRAL WATER COMMISSION, NEW DELHI.

The 65th Meeting of Advisory Committee on Irrigation, Flood control and Multipurpose Projects was held on 14.06.96 at 11.00 hrs. at New Delhi, under the Chairmanship of Secretary, Ministry of Water Resources. Welcoming the participants, the Chairman, requested the Member-Secretary to start the proceedings by taking to the projects one after the other.

A list of participants is enclosed at annexure - I.

Ref No. I : Consideration of projects by the Advisory Committee.

Irrigation Schemes

Sl. No. 9/96-97	:	Rengali Irrigation Sub-Project LBC-II (Major), Orissa.
CCA	:	93501 ha.
Annual Irrigation	:	1,77,651 ha.
Estimated cost	:	Rs. 705.15 Crores (SOR 1995)

Chairman, Advisory Committee, enquired about the status of clearance of the project from Ministry of Environment & Forest & Social Welfare. The Project Authorities appraised the Committee about the status of clearance from Ministry of Environment & Forest, and Ministry of Welfare and that the proposal for dereservation of forest area for whole of the Rengali Irrigation Project has been furnished by Government of Orissa to Ministry of Environment & Forest. Representatives of Ministry of Environment & Forest, informed that the compliance has mostly been done and the clearance is expected to be issued shortly. The Committee was informed that the processing of the clearance from Ministry of Welfare is in advanced stage and the clearance letter is likely to be issued shortly.

The Committee was informed that at the time of clearing the Rengali Irrigation Project earlier, Planning commission has observed to consider the irrigation intensity of 140% and for completion of Soil Survey by the State and to review the cropping pattern. The irrigation intensity of 190% now proposed for this sub-project was also discussed. It was informed that detailed soil surveys has now been done and the State Agriculture Department of Orissa has concurred for the irrigation intensity of 190%. The financial concurrence of the State Finance Planning Department of Government of Orissa for the estimated cost of the project has also been received.

The project was found acceptable subject to arranging the following by Government of Orissa.

i. The clearance from Ministry of Environment & Forest, regarding Environmental & Forest aspects, and

ii. Clearance of R & R Plan from Ministry of Welfare. (The clearance from the Ministry of Welfare has since been received).

(Action : State Government/
Planning Commission.

Annexure No. VI

Terms of Reference
of
Environmental Impact Assessment Study
on
the Rengali Irrigation Sub-Project L.B.C.-II, Phase-II

1. GENERAL SPECIFICATIONS

1.1 GENERAL

1) Basic policy for proceeding EIA

The EIA should be proceeded based on the OCCL inception report. However, there are some gaps for complying with the JICA guideline. JICA supports to fill the gaps.

This terms of reference was prepared to implement the Environmental and Social Impact Assessment Study (hereinafter referred to as the "EIA Study") for the Rengali Irrigation Sub-Project L.B.C.-II, Phase-II (hereinafter referred to as the "Project"). The EIA Study shall be executed and completed by the DoWR and subcontracted local consultant (hereinafter referred to as the "Local Consultant") with supports by the JICA Survey Team for the DoWR Project (hereinafter referred to as the "JICA Survey Team") with the specifications presented hereunder.

2) Main Contents of EIA report

The EIA Study Report consists of the following main contents.

(1) Project Description
(2) Environmental Baseline Data
(3) Scoping EIA Items
(4) Environmental Impact Study
(5) Analysis of alternatives
(6) Environmental Management Plan
(7) Environmental Monitoring Plan
(8) Meeting with Stakeholders
(9) Schedule/ Cost and budget

1.2 OBJECTIVES

The main objectives of the EIA Study by each task are shown below.

- to collect environmental and social baseline information.
- to identify and assess potential impacts on social/natural environment and pollution caused by the Project, and to prepare the Environmental and Social Management and Monitoring Plan (ESMMP) for the necessary actions to the potential environmental and social impacts as well as to proposed mitigation measures.

The EIA Study shall cover relevant requirements as far as practicable under the environmental legislations in India, the JICA Guidelines for Confirmation of Environmental and Social Considerations (2010).

http://www.jica.go.jp/english/our_work/social_environmental/

1.3 STUDY AREA

The study area for the Environment Survey shall cover areas affected by the Project where differs by item of environmental and social considerations. The Project covers 71.313-141.00km, 72,967 ha shown in Figure 1.

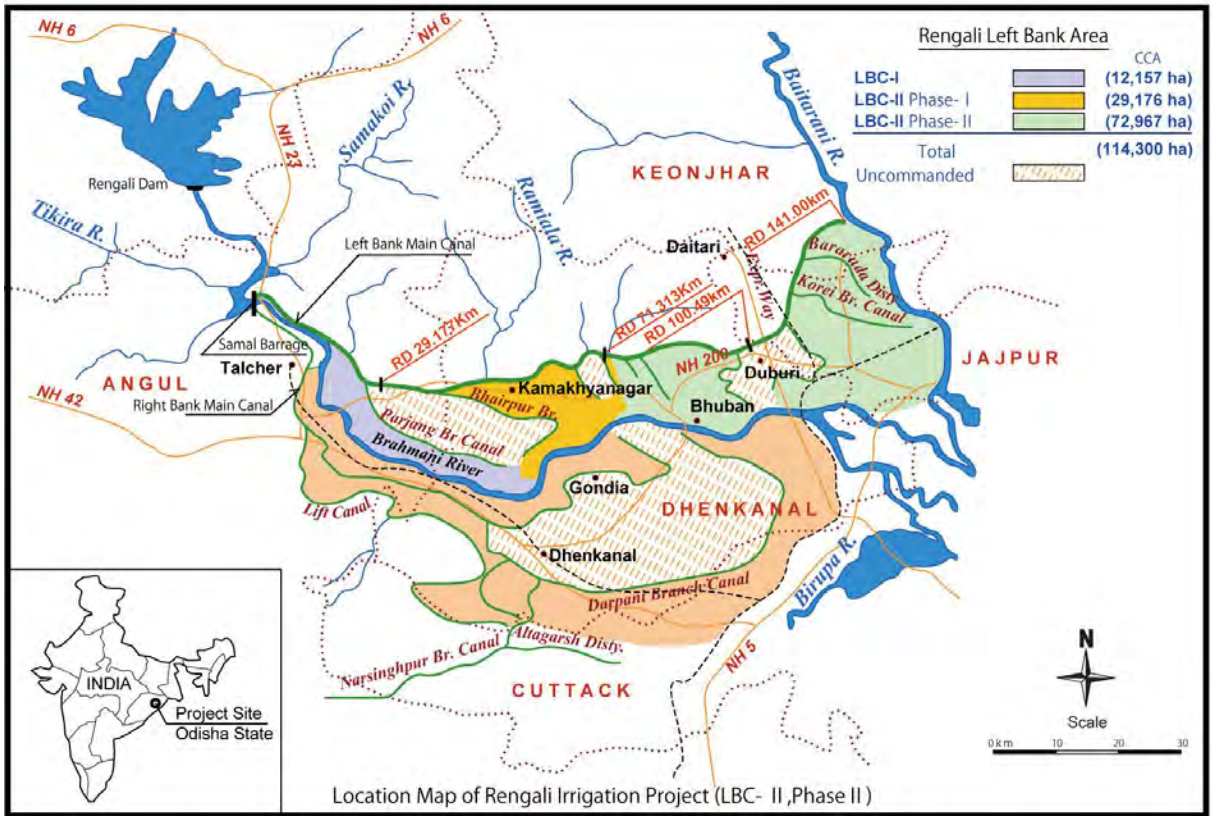


Figure 1 Location Map for the Rengali Irrigation Sub-Project L.B.C.-II, Phase-II

1.4 DEADLINE

The baseline survey report (Electronic data and three sets of document) must be submitted by 25th(Mon) November 2013.

The draft final report (Electronic data and three sets of document) must be submitted by 14th(Mon) December 2013.

2. TECHNICAL SPECIFICATIONS

2.1 BASELINE SURVEY

Secondary data collection and literature review shall be carried out through collection of information and data in the study area. The information and data collected shall be verified and supplemented through the field reconnaissance. The results of the examinations shall not only be described in the text, but also summarized in the maps and drawings with adequate scale, tables and graphs. In addition, the environmental standards and regulations, legal system relating to the implementation of the EIA Study shall be collected and summarized.

2.1.1 Environmental Pollution

Table 1 Recommended method of Environmental Pollution

Research item	Recommended method	Remarks
Sensitive Receptors(SRs)	➢ Identify all the SRs in the Project area, by utilizing the available secondary data (including satellite images), ➢ Field reconnaissance survey and hearings from the local governmental offices and residents.	➢ SRs are schools, hospitals, religious place, etc.
Air pollution	➢ Field survey of PM2.5, PM10, SO2, NOx (Once /non-monsoon season) ➢ Literature collection from state/district government (especially monsoon season)	➢ Survey sites should be around SRs such as school and hospital, etc. ➢ Survey sites also should be near the large level construction sites such as cut and cover area of canal.
Meteorology	➢ Climatic conditions(precipitations, temperature, relative humidity, wind direction and speed) ➢ Literature collection from state/district government	

Research item	Recommended method	Remarks
Surface and ground water quality and riparian use	➢ Field survey of Temp, pH, Conductivity, flow rate, DO, Turbidity, suspended solid, BOD, COD, Total Coliform, Faecal Coliform, Salinity, Agro chemicals (Once /non-monsoon season or two seasons including monsoon season if possible) ➢ Literature collection from state/district government (especially monsoon season)	➢ Affected sites by the Project.
Sediment quality	➢ Field survey of Heavy metals (Once /non-monsoon season or two seasons including monsoon season if possible) ➢ Literature collection from state/district government (especially monsoon season)	➢ Affected sites by the Project.
Ground water level	➢ Ground water level (Once /non-monsoon season)	➢ Survey sites also should be near the sites of deep cut and tunnel.
Noise and Vibration level	➢ Field survey (Once /non-monsoon season) ➢ Literature collection from state/district government	➢ Survey sites should be around SRs such as school and hospital, etc. ➢ Survey sites also should be near the cut and cover area of canal.
Soil	➢ Field survey of Soil characteristics/type ➢ Literature collection from state/district government	➢ Survey sites should be typical sites.

2.1.2 Natural Environment

Table 2 Recommended method of Natural Environment

Research item	Recommended method	Remarks
Geology	➢ Literature collection from state/district government ➢ RS (Remote Sensing)	
Hydrology	➢ Land drainage pattern ➢ Literature collection from state/district government ➢ RS (Remote Sensing)	
Flora and Fauna	➢ Field survey(Once /non-monsoon season or two seasons including monsoon season if possible) ➢ Literature collection from state/district government/NGO (especially monsoon season) ➢ Interview to Nation /State / District government(Forestry department / Wildlife department / NGO) (especially monsoon season)	➢ The lists of flora and fauna are poor in the inception report. Lists of Amphibian, Fish, and insect are necessary. (No lists in the inception report) ➢ Rare and Endangered species should be listed up. ➢ Especially elephant is important. It is necessary to review of the impacts for elephant and effectiveness of Elephant Friendly Ramp by phase I.

Research item	Recommended method	Remarks
Vegetation and Land use	➢ Literature collection from nation/ state/district government/NGO ➢ RS (Remote Sensing)	
Protected Area	➢ Literature collection from nation/state/district government	➢ National Park, Wildlife Protection Area, Sanctuary Biosphre Reserve, Wildlife corridors, tiger and elephant reserve etc,
Recorded Forest	➢ Identification of detail status and boundary information on recorded forest ➢ Literature collection from nation/state/district government	➢ Reserve Forest and Protected Forest, etc

2.1.3 Social Environment

(1) Main Items of the Study

1) Inventory and analyze demographic profile in the study area such as population structure, population density, population development patterns, of each district including scheduled caste and tribes as well as those of below poverty line by using Secondary data including the Report on Rapid Socio-economic Analysis of LBCII, Phase II Area of Irrigation Project by OCCL in association with Xavier Institute.

2) Inventory and analyze socio economic in the study area such as standard of living, extent of the economic development and social and physical infrastructure and facilities of each district, job opportunities, and natural resource usage patterns of each district by using Secondary data

3) Inventory and analyze existing religious and cultural customs and festivals, traditional social institutions, community perception and attitude toward project activities of each district

4) Land tenure system and traditional common use of land and water and inventory them and analyze effect on them as the Project is implemented.

2.2 EIA STUDY

2.2.1 Impact Identification and Assessment

Based on the result of analysis of the baseline surveys, the magnitude and extent of environmental and social impacts accompanied by the project implementation shall be estimated and evaluated as quantitatively as possible including nature, magnitude, extent and location, timing, duration, reversibility, and likelihood. The local consultant shall propose and discuss with the JICA Survey Team on adequate methods for prediction of impacts such as reference as similar cases in Phase I section of the the Rengali Irrigation Sub-Project L.B.C.-II.

2.2.2 Environmental Impact Items

The EIA Study consists of pollution control study, natural environmental study, and social study, impact identification and assessment as explained below.

The following environmental and social impact items, which are identified in the EIA Scoping have to be covered in the EIA Studies, including the environmental and social impact items mentioned in the subsequent sections in detail.

Environmental Pollution control: (1) Air pollution, (2)Water pollution, (3) Bottom sediment (3) Ground water level , (4)Soil pollution ,(5)Noise and vibration,(6)Waste, (7) Disaster

Natural environment: (1) Topography and geological features, (2) Soil erosion, , (3) Hydrological situation, (4) Flora, fauna and biodiversity, (5) Landscape, (6) Global warming

Social environment: (1) Involuntary Resettlement including social impact due to land acquisition without resettlement (Summarizing the RRP report.), (2) local economy such as employment, livelihood, etc., (3) (Surrounding) land use and utilization of local resources, (4) Social institutions (including regional severance), (5) Existing social infrastructure and services, (6) Socially vulnerable groups(such as Poor, indigenous, or ethnic people, etc), (7) Misdistribution of benefit and damage, (8) Historical and cultural heritage, (9) Local conflict of interests (10) Sanitation, (11)Gender,(12) Children's right, (13) Hazardous (risk) infectious diseases such as HIV/AIDS→Maralia, (14) Accident, (15)Occupational safety.

2.3 ANALYSIS OF ALTERNATIVES AND PREPARATION OF MITIGATION MEASURES

Feasible and cost effective mitigation measures for the Project shall be proposed. The mitigation measure is to prevent or reduce the negative impacts predictable in the result of impact assessment. Aspects of mitigation measure which should be considered including target level of impact mitigation, method, expected effect, timing, duration, institutional arrangement, and cost. In addition, residual impacts which can not be prevented or reduced by the mitigation measures shall be identified.

2.4 ENVIRONMENTAL MANAGEMENT PLAN

Based on the identified mitigation measures as specified in Section 2.3, the Environmental and Social Management Plan (ESMP) shall be prepared. The ESMP shall cover mitigatory action, method, implementation stage, frequency and responsible organization(s) for each negative impact for each mitigatory action at minimum. The management plan shall be separately prepared for the construction phase and operation phase. The sample form of the ESMP is attached.

2.5 ENVIRONMENTAL MONITORING PLAN

Environmental and Social Monitoring Plan (ESMoP) spanning for 3 - 5 years for the areas or units subject to Environmental and Social Management Plan for aspects of natural environment, pollution control, and social environment shall be elaborated. The ESMP shall cover mitigatory action, method, implementation stage, frequency and responsible organization(s) for each negative impact for each

mitigatory action at minimum. The monitoring plan shall be separately prepared for the construction phase and operation phase.

2.6 MEETING WITH STAKEHOLDERS

Meetings with stakeholders for EIA shall be carried out by the DoWR in cooperation with Local Consultant to collect opinions of the public and to disseminate information on the Project.

The Meeting shall be conducted at the time of preparations of draft final report of the EIA Study report. Information about findings of EIA study and probable mitigation measures shall be disseminated to the general public that are directly or indirectly affected by the Project and to obtain their feedback and opinions of above discussions and reflect their comments and request on the environmental and social mitigation measures, and ESMMP.

2.7 DISCLOSURE OF THE EIA REPORT

The Local Consultant shall assist DoWR on disclosure of draft EIA and final EIA reports.

End

Superintending Engineer
Rangali O.E.C.F. Circle
Kamakhyanagar, Dkl

Design Statement of L.B.C-II (RD 71.313 Km to 100.490 Km)

Sl. No.	Structure Description	R.D in Mtrs.	GCA in Ha.	CCA in Ha.	Discharge in Cumec (1,250Ha /Cumec)	Canal Losses in Cumec	Offtaking Canal Losses in Cumec	Total Disch. in Cumec	Cum. Disch. in Cumec	Final Disch. in Cumec	Design Disch. in Cumec	Design Bed Width in Mtrs.	Design F.S.D. in Mtrs.	Bed Slope 'S' in Mtr. per 1,000Mtrs.	Rough. Coeff. 'N'	Vel. in M/Sec	Free Board in Mtrs.	Road Width L/R in Mtrs.	Wetted Perimt. in Mtrs.	Wetted Area in Sq.Mtr.	CVR	B.L. U/S in Mtrs.	B.L. D/S in Mtrs.	F.S.L. U/S in Mtrs.	F.S.L. D/S in Mtrs.	Fall or Loss in Mtrs.	Remarks
		71,313				0.0644			112.3179	112.3179	114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	28,638.0	0.72	60.568	60.518	64.868	64.818	0.050	Z=1.5H:1V
1	C.R	72,150				0.0277			112.2535		114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	12,317.4	0.72	60.484	60.434	64.734	64.734	-	Up to
2	CD (CA=16.50Sq. Km)	72,510	114	80	0.0640	0.0144	0.0064	0.0704	112.2258	112.1554	114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	6,398.2	0.72	60.398	60.398	64.698	64.698		101.490Km
3	Sitalbasi Sub-Minor	72,697				0.0212			112.1410		114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	9,443.4	0.72	60.380	60.380	64.680	64.680		
4	VRB (CA = 119.50Sq. Km)	72,973				0.0300			112.1197		114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	13,343.9	0.72	60.352	60.352	64.652	64.652		
5	CD (CA=119.50Sq. Km)	73,363	203	142	0.1136	0.0194	0.0114	0.1250	112.0897	111.9647	114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	8,622.2	0.72	60.313	60.313	64.613	64.613		
6	Badakathia Sub-Minor	73,615				0.0235			111.9453		114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	10,435.6	0.72	60.288	60.288	64.588	64.588		
7	CD (CA=0.92Sq. Km)	73,920				0.0686			111.9218		114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	30,485.6	0.72	60.257	60.257	64.557	64.557		
8	VRB	74,811				0.0251			111.8533		114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	11,154.1	0.72	60.169	60.168	64.468	64.468		
9	VRB	75,137				0.0089			111.8282		114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	3,934.7	0.72	60.136	60.136	64.436	64.436		
10	CD (CA=3.92Sq. Km)	75,252				0.0349			111.8193		114.725	24.60	4.30	0.10	0.0225	0.997	1.00	5.0/8.0	34.215	15,499.4	0.72	60.124	60.124	64.424	64.424		
11	ODR Bridge	75,705	10,309	7,216	5.7728	0.0964	2.0205	7.7933	111.7744	103.9811	104.312	23.30	4.20	0.10	0.0225	0.978	1.00	5.0/8.0	32.691	42,825.8	0.71	60.079	60.129	64.379	64.329	0.050	
12	Bhadra Branch Canal cum CR	77,015				0.0327			103.8948		104.312	23.30	4.20	0.10	0.0225	0.978	1.00	5.0/8.0	32.691	14,547.7	0.71	59.998	59.998	64.198	64.198		
13	CD (CA=6.57Sq. Km)	77,460				0.0397			103.8621		104.312	23.30	4.20	0.10	0.0225	0.978	1.00	5.0/8.0	32.691	17,653.4	0.71	59.953	59.953	64.153	64.153		
14	CD (CA=1.27Sq. Km)	78,000				0.0160			103.8223		104.312	23.30	4.20	0.10	0.0225	0.978	1.00	5.0/8.0	32.691	7,126.7	0.71	59.899	59.899	64.099	64.099		
15	VRB	78,218	2,245	1,572	1.2576	0.0384	0.3144	1.5720	103.8063	102.2343	104.312	23.30	4.20	0.10	0.0225	0.978	1.00	5.0/8.0	32.691	17,063.0	0.71	59.878	59.878	64.078	64.078		
16	Kuninda Disty.	78,780				0.0434			102.1959		104.312	23.30	4.20	0.10	0.0225	0.978	1.00	5.0/8.0	32.691	19,288.0	0.71	59.825	59.825	64.025	64.025		
17	CD (CA=3.25Sq. Km)	79,330				0.0257			102.1525		104.312	23.30	4.20	0.10	0.0225	0.978	1.00	5.0/8.0	32.691	11,442.0	0.71	59.766	59.766	63.966	63.966		
18	CD (CA=5.25Sq.Km)	79,680				0.0249			102.1268		102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	11,077.9	0.71	59.731	59.681	63.931	63.881	0.050	
19	CR cum Escape	80,022				0.0069			102.1018		102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	3,077.2	0.71	59.647	59.647	63.847	63.847		
20	VRB	80,117	218	153	0.1224	0.0109	0.0122	0.1346	102.0949	101.9603	102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	4,858.7	0.71	59.638	59.638	63.838	63.838		
21	Bhalukipatala Minor	80,267				0.0259			101.9493		102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	11,531.4	0.71	59.623	59.623	63.823	63.823		
22	VRB	80,623				0.0187			101.9234		102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	8,324.6	0.71	59.587	59.587	63.787	63.787		
23	CD (CA=3.35Sq. Km)	80,880	(690	483	0.3864	0.0612	0.0386	0.4250	101.9047	101.4796	102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	27,208.8	0.71	59.561	59.561	63.761	63.761		
24	Kankadapal Minor	81,720				0.0090			101.4184		102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	4,016.5	0.71	59.477	59.477	63.677	63.677		
25	VRB	81,844				0.0675			101.4094		102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	29,994.5	0.71	59.465	59.465	63.665	63.665		
26	CD (CA=5.50Sq.Km)	82,770				0.0361			101.3419		102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	16,066.2	0.71	59.372	59.372	63.572	63.572		
27	CD (CA=5.13Sq.Km) (CA = 8.12Sq.Km)	83,266				0.0083			101.3057		102.897	23.00	4.20	0.10	0.0225	0.976	1.00	5.0/8.0	32.391	3,692.6	0.71	59.323	59.323	63.523	63.523		
28	VRB	83,380	375	263	0.2104	0.0520	0.0210	0.2314	101.2974	101.0660	101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	23,105.9	0.71	59.311	59.261	63.511	63.461	0.050	
29	Kaduabandi Minor cum CR	84,100				0.0586			101.0140		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	26,026.2	0.71	59.189	59.189	63.389	63.389		
30	CD (CA=8.25Sq.Km)	[illegible]				[illegible]			[illegible]		[illegible]			[illegible]														
31	Jemedeipur Sub-Minor	85,350				0.0433			100.8181		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	19,254.9	0.71	59.064	59.064	63.264	63.264		
32	CD (CA=10.250Sq.Km)	85,950	1,677	1,174	0.9392	0.0700	0.0939	1.0331	100.7748	99.7417	101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	31,128.7	0.71	59.004	59.004	63.204	63.204		
33	Kuhika Disty.	86,920				0.0212			99.6717		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	9,402.8	0.71	58.907	58.907	63.107	63.107		
34	VRB	87,213				0.0063			99.6505		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	2,792.0	0.71	58.878	58.878	63.078	63.078		
35	VRB	87,300				0.0440			99.6442		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	19,575.8	0.71	58.869	58.869	63.069	63.069		
36	CD (CA=4.25Sq. Km.)	87,910				0.0004			99.6002		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	160.5	0.71	58.808	58.808	63.008	63.008		
37	VRB	87,915	172	120	0.0960	0.0225	0.0096	0.1056	99.5998	99.4942	101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	10,012.5	0.71	58.808	58.808	63.008	63.008		
38	Nuadihi Minor	88,227				0.0197			99.4717		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	8,761.0	0.71	58.777	58.777	62.977	62.977		
39	VRB	88,500				0.0614			99.4520		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	27,277.8	0.71	58.749	58.749	62.949	62.949		
40	CD (CA=6.68Sq. Km)	89,350				0.0116			99.3906		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	5,134.0	0.71	58.664	58.664	62.864	62.864		
41	CD (CA=9.29Sq. Km.)	89,510				0.0363			99.3790		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	16,142.0	0.71	58.648	58.648	62.848	62.848		
42	VRB (Kanajpal Village Road)	90,013				0.0349			99.3427		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	19,960.9	0.71	58.598	58.598	62.798	62.798		
43	CD (CA=29.00Sq. Km.)	[illegible]				0.0625			[illegible]		101.483	22.70	4.20	[illegible]			1.00	5.0/8.0										
44																											
45		91,500				0.0443			99.2359		101.483	22.70	4.20	0.10	0.0225	0.974	1.00	5.0/8.0	32.091	19,672.1	0.71	58.449	58.449	62.649	62.649		

CHECKED
Asstt. Engineer
Design Division

SUBMITTED

APPROVED

Asstt. Engineer
Design Division
EL

Annexure No. VII

Design Statement of L.B.C-II (RD 71.313 Km to 100.490 Km)

Structure Description	R.D in Mtrs.	GCA in Ha.	CCA in Ha.	Discharge in Cumec (1,250Ha /Cumec)	Canal Losses in Cumec	Offtaking Canal Losses in Cumec	Total Disch. in Cumec	Cum. Disch. in Cumec	Final Disch. in Cumec	Design Disch. in Cumec	Design Bed Width in Mtrs.	Design F.S.D in Mtrs.	Bed Slope 'S' in Mtr. per 1,000Mtrs.	Rough. Coeff. 'N'	Vel. in M/Sec	Free Board in Mtrs.	Road Width L/R in Mtrs.	Wetted Perimt. in Mtrs.	Wetted Area in Sq.Mtr.	CVR	B.L. U/S in Mtrs.	B.L. D/S in Mtrs.	F.S.L. U/S in Mtrs.	F.S.L. D/S in Mtrs.	Fall or Loss in Mtrs.	Remarks
46-Demodarpur Disty. cum CR	92,113	2,503	1,752	1.4016	0.0223	0.3504	1.7520	99.1911	97.4391	97.694	22.30	4.15	0.10	0.0225	0.966	1.00	5.0/3.0	31.580	9,916.0	0.71	58.388	58.388	62.588	62.538	0.050	
47 VRB	92,427				0.0734			97.4168		97.694	22.30	4.15	0.10	0.0225	0.966	1.00	5.0/3.0	31.580	32,621.8	0.71	58.357	58.357	62.507	62.507		
48 VRB	93,460				0.0340			97.3434		97.694	22.30	4.15	0.10	0.0225	0.966	1.00	5.0/3.0	31.580	15,126.7	0.71	58.253	58.253	62.403	62.403		
49 CD (CA=8.250Sq.Km) (CA = 8.925 Sq.Km)	93,939				0.0754			97.3093		97.694	22.30	4.15	0.10	0.0225	0.966	1.00	5.0/3.0	31.580	33,506.0	0.71	58.205	58.205	62.355	62.355		
50 Kamaladeipur Sub-Minor	95,000	167	117	0.0936	0.0369	0.0094	0.1030	97.2340	97.1310	97.694	22.30	4.15	0.10	0.0225	0.966	1.00	5.0/3.0	31.580	16,421.4	0.71	58.099	58.099	62.249	62.249		
51 CD (CA=1.300Sq.Km)	95,520				0.0325			97.0940		97.694	22.30	4.15	0.10	0.0225	0.966	1.00	5.0/3.0	31.580	14,463.5	0.71	58.047	58.047	62.197	62.197		
52 VRB	95,978				0.0193			97.0615		97.694	22.30	4.15	0.10	0.0225	0.966	1.00	5.0/3.0	31.580	8,589.7	0.71	58.002	58.002	62.152	62.152		
53 CD (CA=35.750Sq.Km)	96,250				0.0284			97.0422		97.694	22.30	4.15	0.10	0.0225	0.966	1.00	5.0/3.0	31.580	12,631.9	0.71	57.574	57.974	62.124	62.124		
54 Sukinda Branch Canal cum CR cum Escape	96,650	9,225	6,458	5.1664	0.0294	1.8082	6.9746	97.0138	90.0391	90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	13,058.2	0.71	57.934	57.934	62.084	62.034	0.050	
55 CD (CA=0.500Sq.Km)	97,080				0.0550			90.0097		90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	24,446.1	0.71	57.891	57.891	61.991	61.991		
56 VRB	97,885				0.0085			89.9547		90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	3,765.6	0.71	57.811	57.811	61.911	61.911		
57 CD (CA=0.870Sq. Km.)	98,009				0.0455			89.9463		90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	20,225.0	0.71	57.798	57.798	61.898	61.898		
58 CD (CA=0.750Sq. Km.)	98,675				0.0103			89.9008		90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	4,585.5	0.71	57.732	57.732	61.832	61.832		
59 VRB	98,826				0.0606			89.8904		90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	26,936.3	0.71	57.717	57.717	61.817	61.817		
60 CD (CA=4.625Sq. Km.)	99,713				0.0148			89.8298		90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	6,589.8	0.71	57.628	57.628	61.728	61.728		
61 VRB	99,930				0.0383			89.8150		90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	17,006.0	0.71	57.606	57.606	61.706	61.706		
62 Heavy cutting starts	100,490				0.0000			89.7767		90.328	21.20	4.10	0.10	0.0225	0.953	1.00	5.0/3.0	30.368	0.0	0.71	57.550	57.550	61.650	61.650		
	Total	28,070	19,650																							

DRG. NO. BLB-214

Assumptions :

1. Duty 1,250 Ha/Cumec
2. Transmission Loss 2.25 Cumec /100Ha
3. Offtaking Loss
   - 45 % (10 Cumec < Q)
   - 35 % (5 Cumec < Q ≤ 10 Cumec)
   - 25 % (1 Cumec < Q ≤ 5 Cumec)
   - 10 % (Q ≥ 1 Cumec)
4. CCA (Cultivable Command Area) 70 % of GCA (Gross Command Area)
   Slope (Unlined Canal) (in hydraulic calculation)

Notes :

1. CCA to GCA percentage is 70%
2. This supersedes approval of L.S & D.S vide EIC lr. No.1714(WE)/IIBSR dtd 20.12.1997
3. Location of offtaking canals is subjected to change as per field condition.
4. Location of VRB and CD may be changed as per the field condition.

Submitted
Executive Engineer
OHCF Division-VI
Bhuban

Checked
Assistant Engineer
Designs Division
BLB Samal.

Checked
Executive Engineer
Design Division
Designs Division
SAMAL

Superintending Engineer
Rengali OHCF Circle
Chandrakhyanagar

Chief Engineer & Project Manager
Brahmani Left Bank Canal Project
Bhuta, Samal

Annexure No. VIII

SHEET NO

Rengali Irrigation Project
LBC-II (RD 100.490 km to 141.00 km)
Design Statement

Sr. No	Structure Description	RD	G.C.A	C.C.A (70%)	Required Discharge (1250 Ha / Cumecs)	Canal losses @ 2.25 cumecs /mm^2	Offtaking canal losses	Total discharge	Cumulative Discharge	Final discharge	Design discharge	Bed Width	FSD	Free Board	Side Slope	Area	Perimeter	Bed Slope	Value of N'	Actual Velocity	Velocity Ratio (CVR)	Bed Level U/S	Bed Level D/S	F.S.L U/S	F.S.L D/S	Fall or Loss in mtrs	Remarks
		m	Ha	Ha	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	m	m	m		sqm	m	1 in	n'	Va	V/Vo	m	m	m	m	m	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	Heavy cutting starts	100490			0.000			0.000	89.605	89.605	90.752	11.60	4.10	1.00	0.25	51.8	20.052	4500	0.016	1.753	1.302	57.550	57.500	61.650	61.600	0.05	
2	Road crossing	100520				0.01150			89.604																		
3	Nalla crossing (CA= 3.188 sqkm)	100775				0.01511				89.592	90.752	11.60	4.10	1.00	0.25	51.8	20.052	4500	0.016	1.753	1.302	57.493	57.493	61.593	61.593		
4	Lift canal-7	101110	4274.3	2992.0	2.394	0.01456	0.598	2.992	89.592	89.592	90.752	11.60	4.10	1.00	0.25	51.8	20.052	4500	0.016	1.753	1.302	57.437	57.437	61.537	61.537		
5	CT crossig	101435				0.01515			89.577	89.585	90.752	11.60	4.10	1.00	0.25	51.8	20.052	4500	0.016	1.753	1.302	57.382	57.382	61.482	61.462		
6	Road crossing	101714				0.01551			89.561	89.571	90.752	11.60	4.10	1.00	0.25	51.8	20.052	4500	0.016	1.753	1.302	57.362	57.362	61.462	61.462		
7	Nalla crossing (CA= 1.581 sqkm)	101910				0.02030			89.535	89.535	90.752	11.60	4.10	1.00	0.25	51.8	20.052	4500	0.016	1.753	1.302	57.290	57.290	61.390	61.390		
8	Heavy cutting ends	102460				0.02016			89.499	89.499	90.754	11.60	4.10	1.00	0.25	51.8	20.052	4500	0.016	1.753	1.302	57.117	57.117	61.217	61.217		
9	Super passage -1(CA= 10.067 sq.km)	103040		0.000	0.000	0.01758		0.000	89.479	89.479	89.163	21.00	4.05	1.00	0.5	93.3	30.056	10000	0.0225	0.945	0.707	56.940	56.940	61.040	61.040		
10	Express highway bridge	104200				0.01826			89.447	89.447	89.163	21.00	4.05	1.00	0.5	93.3	30.056	10000	0.0225	0.945	0.707	56.840	56.790	60.940	60.840	0.05	
11	VRB (CT)-1	104470				0.00972			89.428	86.429	89.163	21.00	4.05	1.00	0.5	93.3	30.056	10000	0.0225	0.945	0.707	56.742	56.742	60.792	60.792		
12	SP (CT/Nalla)-2- CA= 11.83 sqkm	104590				0.01752			89.411	89.411	89.163	21.00	4.05	1.00	0.5	93.3	30.056	10000	0.0225	0.945	0.707	56.716	56.716	60.766	60.766		
13	Super passage-1 (CA= 13.3675 sq.km)	104855				0.02265			89.403	89.403	89.163	21.00	4.05	1.00	0.5	93.3	30.056	10000	0.0225	0.945	0.707	56.689	56.689	60.739	60.739		
14	VRB (Road)-2	105190				0.01498			89.385	86.385	89.163	21.00	4.05	1.00	0.5	93.3	30.056	10000	0.0225	0.945	0.707	56.677	56.677	60.727	60.727		
15	Jakhapura Br. Canal / CR	105410	884.0	6190.0	4.953	0.01877	1.238	6.191	89.362	89.362	89.163	21.00	4.05	1.00	0.5	93.3	30.056	10000	0.0225	0.945	0.707	56.651	56.651	60.701	60.701		
16	CD work-1 (CA = 5.375 sqkm)	105560				0.01400			89.347	89.157	89.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.945	0.707	56.617	56.617	60.667	60.667		
17	Ex. Canal (SP)-1	105775				0.02038			89.147	89.147	89.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.595	56.545	60.645	60.545	0.05	
18	Ex. Canal (SP)-2	106180				0.03386			89.133	89.133	89.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.530	56.530	60.530	60.530		
19	Lift canal-8	106700	126.0	86.2	0.071	0.01406	0.007	0.078	89.106	89.106	89.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.509	56.509	60.509	60.509		
20	VRB (CT)-3	106925				0.00951			89.073	79.995	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.468	56.468	60.468	60.468		
21	VRB (CT)-4	107071				0.02077			79.980	79.980	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.416	56.416	60.416	60.416		
22	VRB (CT)-5	107390				0.01101			79.971	79.971	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.394	56.394	60.394	60.394		
23	Barkhal minor	107559	929.0	650.3	0.520	0.00653	0.052	0.572	79.950	79.950	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10010	0.0225	0.933	0.703	56.347	56.347	60.347	60.347		
									79.939	79.307	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.330	56.330	60.330	60.330		

Hydropneum Systems, Pune

Sr. No	Structure Description	RD	G.C.A	C.C.A (70%)	Required Discharge (1250 Ha / cumecs)	Canal losses @ 2.25 cumecs /mm^2	Offtaking canal losses	Total discharge	Cummulative. Discharge	Final discharge	Design discharge	Bed Width	FSD	Free Board	Side Slope	Area	Perimeter	Bed Slope	Value of N'	Actual Velocity	Velocity Ratio (CVR)	Bed Level U/S	Bed Level D/S	F.S.L U/S	F.S.L D/S	Fall or Loss in mtrs	Remarks
		m	Ha	Ha	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	m	m	m		sqm	m	1 in	n'	Va	V/Vo	m	m	m	m	m	
24	VRB (Road)-6	108120				0.01889	0.0000	0.000	79.331	79.331	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.274	56.274	60.274	60.274		
25	Ex. canal -3	108410				0.02507			79.312	79.312	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.245	56.245	60.245	60.245		
26	VRB (CT)-7	108795				0.00423			79.287	79.287	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.207	56.207	60.207	60.207		
27	CD work-2 (CA = 13.875 sqkm)	108860				0.03960			79.283	79.283	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.200	56.200	60.200	60.200		
28	Railway crossing	109468				0.01511			79.243	79.243	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.139	56.139	60.139	60.139		
29	Bajrapalli minor	109700	171.0	119.7	0.095	0.04402	0.0096	0.105	79.228	79.123	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.116	56.116	60.116	60.116		
30	VRB (CT)-8	110376				0.01068			79.079	79.079	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.048	56.048	60.048	60.048		
31	CD work-3 (CA= 7.687 sqkm)	110540				0.04689			79.068	79.068	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	56.032	56.032	60.032	60.032		
32	VRB (CT)-9	111260				0.00912			79.021	79.021	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.960	55.960	59.960	59.960		
33	Nilkanthapur minor	111400	203.0	142.1	0.114	0.01205	0.0114	0.125	79.012	78.887	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.946	55.946	59.946	59.946		
34	VRB (CT)-10	111585				0.03549			78.875	78.875	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.928	55.928	59.928	59.928		
35	VRB (CT)-11	112130				0.03419			78.839	78.839	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.873	55.873	59.873	59.873		
36	CD work-4(CA= 1.937 sqkm)	112655				0.04461			78.805	78.805	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.821	55.821	59.821	59.821		
37	Nahuranipokhari sub mi	113340	85.0	59.5	0.048	0.01400	0.0048	0.052	78.761	78.708	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.752	55.752	59.752	59.752		
38	VRB (Road)-12	113555				0.01433			78.694	78.694	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.731	55.731	59.731	59.731		
39	VRB (CT)-13	113775				0.00226			78.680	78.680	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.709	55.709	59.709	59.709		
40	CD work -5(CA= 35.068 sqkm)	113810				0.01107			78.678	78.678	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.705	55.705	59.705	59.705		
41	Ex. canal -4	113980				0.02670			78.667	78.667	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.688	55.688	59.688	59.688		
42	VRB (CT)-14	114390				0.02865			78.640	78.640	82.082	20.00	4.00	1.00	0.5	88.0	28.944	10000	0.0225	0.933	0.703	55.647	55.647	59.647	59.647		
43	Korel branch canal / CR	114630	38589.0	27012.3	21.610	0.03224	9.724	31.3	78.611	47.277	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	55.603	55.603	58.603	58.903		
44	Super passage -4(CA= 4.255 sqkm)	115430				0.02337			47.245	47.245	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	55.543	55.543	58.843	58.843		
45	Super passage-5 (CA= 0.255 sqkm)	115865				0.01343			47.221	47.221	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	55.500	55.500	58.800	58.800		
46	Super passage-6 (CA= 4.062 sqkm)	116115				0.06904			47.208	47.208	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	55.475	55.475	58.775	58.775		
47	VRB (CT)-15	117400				0.09080			47.139	47.139	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	55.346	55.346	58.646	58.646		
48	Super passage-7 (CA= 4.125 sqkm)	119090				0.03546			47.048	47.048	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	55.177	55.177	58.477	58.477		

Design statement

SHEET

Sr. No	Structure Description	R.D	G.C.A	C.C.A (70%)	Required Discharge (1250 Ha / cumecs)	Canal losses @ 2.25 cumecs /mm^2	Offtaking canal losses	Total discharge	Cummulative Discharge	Final discharge	Design discharge	Bed Width	FSD	Free Board	Side Slope	Area	Perimeter	Bed Slope	Value of N'	Actual Velocity	Velocity Ratio (CVR)	Bed Level U/S	Bed Level D/S	F.S.L U/S	F.S.L D/S	Fall or Loss in mtrs	Remarks
		m	Ha	Ha	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	m	m	m		sqm	m	1 in	n'	Va	V/Vo	m	m	m	m	m	
49	Lift canal -9	119750	4760.0	3332.0	2.666	0.03224	0.666	3.332	47.013	43.681	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	55.111	55.111	58.411	58.41		
50	VRB (CT)-16	120360				0.04191			43.648	43.648	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	55.051	55.051	58.351	58.35		
51	Super passage-8 (CA= 0.30 sqkm)	121130				0.03062			43.607	43.607	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	54.973	54.973	58.273	58.273		
52	Super passage-9 (CA= 2.260 sqkm)	121355				0.03842			43.576	43.576	49.143	16.50	3.30	1.00	0.5	59.9	23.879	10000	0.0225	0.820	0.700	54.951	54.951	58.251	58.251		
53	Barapada Br. Canal / CR	121700	9785.0	6849.5	5.480	0.04380	1.918	7.397	43.537	36.140	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.916	54.916	58.216	58.016		
54	VRB (Road)-17	122070				0.03674			36.096	36.096	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.879	54.879	57.979	57.979		
55	CD work-6 (CA= 19.625 sqkm)	122630				0.01036			36.059	36.059	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.823	54.823	57.923	57.923		
56	Underpass (CT)-1	122850				0.00706			36.049	36.049	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.801	54.801	57.901	57.901		
57	Underpass (CT)-2	123000				0.02143			36.042	36.042	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.786	54.786	57.886	57.886		
58	CD work-7 (CA= 2.120 sqkm)	123065				0.03744			36.021	36.021	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.780	54.780	57.880	57.880		
59	Dipapal minor	123455	167.0	116.9	0.094	0.02543	0.009	0.103	35.983	35.880	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.741	54.741	57.841	57.841		
60	Underpass (CT)-3	123860				0.01837			35.855	35.855	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.700	54.700	57.800	57.800		
61	Underpass (CT)-4	123995				0.01201			35.837	35.837	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.687	54.687	57.787	57.787		
62	Aqueduct-Kusel river	124250				0.02967			35.825	35.825	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.661	54.361	57.761	57.461	0.30	
63	VRB (CT)-18	124880				0.00212			35.795	35.795	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.298	54.298	57.398	57.398		
64	CD work-8 (CA= 1.31 sqkm)	124925				0.00989			35.793	35.793	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.294	54.294	57.394	57.394		
65	VRB (CT)-19	125135				0.03344			35.783	35.783	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.273	54.273	57.373	57.373		
66	Ex. canal -5	125845				0.00542			35.749	35.749	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.202	54.202	57.302	57.302		
67	Deogan minor	125960	743.0	520.1	0.416	0.02402	0.042	0.458	35.744	35.286	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.190	54.190	57.290	57.290		
68	CD work-9 (CA= 1.187 sqkm)	126470				0.03344			35.262	35.262	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.139	54.139	57.239	57.239		
69	Ex. canal -6	127180				0.03297			35.229	35.229	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	54.068	54.068	57.168	57.168		
70	Bairampur minor	127880	365.0	255.5	0.204	0.00989	0.020	0.225	35.196	34.971	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.998	53.998	57.098	57.098		
71	VRB (CT)-20	128090				0.01907			34.961	34.961	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.977	53.977	57.077	57.077		
72	CD work-10(CA= 1.622sqkm)	128495				0.00353			34.942	34.942	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.937	53.937	57.037	57.037		
73	VRB (CT)-21	128570				0.01719			34.939	34.939	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.929	53.929	57.029	57.029		

Hydropneum Systems, Pune

Design statement

SHEET NO

Sr. No	Structure Description	RD	G.C.A	C.C.A (70%)	Required Discharge (1250 Ha / cumecs)	Canal losses @ 2.25 cumecs /mm^2	Offtaking canal losses	Total discharge	Cummulative Discharge	Final discharge	Design discharge	Bed Width	FSD	Free Board	Side Slope	Area	Perimeter	Bed Slope	Value of N'	Actual Velocity	Velocity Ratio (CVR)	Bed Level U/S	Bed Level D/S	F.S.L U/S	F.S.L D/S	Fall or Loss in mtrs	Remarks
		m	Ha	Ha	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	m	m	m		sqm	m	1 in	n'	Va	V/Vo	m	m	m	m	m	
74	CD work -11(CA= 1.687 sqkm)	128935				0.04074			34.921	34.921	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.893	53.893	56.993	56.993		
75	CD work-12 (CA= 30.43 sqkm)	129800				0.01248			34.881	34.881	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.806	53.806	56.906	56.906		
76	Ex. canal -7	130065				0.01648			34.868	34.868	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.780	53.780	56.880	56.880		
77	C D work-13 (CA= 0.875sqkm)	130415				0.00636			34.852	34.852	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.745	53.745	56.845	56.845		
78	Nanduan minor	130550	835.0	584.5	0.468	0.01177	0.047	0.514	34.846	34.331	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.731	53.731	56.831	56.831		
79	VRB-22	130800				0.01225			34.319	34.319	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.706	53.706	56.806	56.806		
80	Super passage-10 (CA= 1.875 sqkm)	131060				0.07983			34.307	34.307	37.362	14.00	3.10	1.00	0.5	48.2	20.932	10000	0.0225	0.775	0.688	53.680	53.680	56.780	56.780		
81	Salpada Dy / CR	132755	4140.0	2902.2	2.322	0.01528	0.580	2.902	34.227	[redacted]		13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.511	53.511	56.611	56.611		
82	CD work-14 (CA 1.562 sqkm)	133100				0.00833			31.310	31.310	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.476	53.476	56.376	56.376		
83	VRB-23	133288				0.03419			31.301	31.301	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.457	53.457	56.357	56.357		
84	CD work-15 (CA= 0.562 sqkm)	134060				0.00864			31.267	31.267	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.380	53.380	56.280	56.280		
85	VRB (CT)-24	134255				0.00731			31.258	31.258	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.361	53.361	56.261	56.261		
86	CD work-16 (CA= 0.812 sqkm)	134420				0.01993			31.251	31.251	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.344	53.344	56.244	56.244		
87	Super passage-11 (CA= 0.437sqkm)	134870				0.00405			31.231	31.231	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.299	53.299	56.199	56.199		
88	VRB (CT)-25	134975				0.01262			31.227	31.227	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.289	53.289	56.189	56.189		
89	CD work-17 (CA= 3.37 sqkm)	135260				0.01107			31.214	31.214	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.260	53.260	56.160	56.160		
90	Ex. canal -8	135510				0.03696			31.203	31.203	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.235	53.235	56.135	56.135		
91	VRB (CT)-26	136345				0.02237			31.166	31.166	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.152	53.152	56.052	56.052		
92	VRB (CT)-27	136850				0.00266			31.144	31.144	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.101	53.101	56.001	56.001		
93	Ex. canal -9	136910				0.02657			31.141	31.141	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.095	53.095	55.995	55.995		
94	CD work-18 (CA= 1.75 sqkm)	137510				0.01528			31.114	31.114	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.035	53.035	55.935	55.935		
95	VRB (CT)-28	137855				0.00731			31.099	31.099	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	53.001	53.001	55.901	55.901		
96	CD work-19 (CA= 1.01 sqkm)	138020				0.00684			31.092	31.092	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	52.984	52.984	55.884	55.884		
97	VRB -29	138170				0.01129			31.085	31.085	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	52.969	52.969	55.869	55.869		
98	VRB (CT)-30	138425				0.01661			31.074	31.074	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	52.944	52.944	55.844	55.844		

Hydropneum Systems, Pune

Sr. No	Structure Description	RD	G.C.A	C.C.A (70%)	Required Discharge (1250 Ha / cumecs)	Canal losses @ 2.25 cumecs /mm^2	Offtaking canal losses	Total discharge	Cummulative. Discharge	Final discharge	Design discharge	Bed Width	FSD	Free Board	Side Slope	Area	Perimeter	Bed Slope	Value of N'	Actual Velocity	Velocity Ratio (CVR)	Bed Level U/S	Bed Level D/S	F.S.L U/S	F.S.L D/S	Fall or Loss in mtrs	Remarks
		m	Ha	Ha	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	Cumecs	m	m	m		sqm	m	1 in	n'	Va	V/Vo	m	m	m	m	m	
99	CD work-20 (CA= 3.51 sqkm)	138800				0.04407			31.057	31.057	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	52.906	52.906	55.806	55.806		
100	CT/ Nalla (SP) -12CA = .310 sqkm	139795				0.00775			31.013	31.013	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	52.807	52.807	55.707	55.707		
101	VRB (CT)-31	139970				0.00531			31.005	31.005	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	52.789	52.789	55.689	55.689		
102	Future Ext.(Salandi system)	140000		4379.2	31.000	0.00000		31.00	31.000	0.000	31.535	13.20	2.90	1.00	0.5	42.5	19.685	10000	0.0225	0.742	0.688	52.777	52.777	55.677	55.677		
						0.00000																					
			74022	51816	72.452	2.22408	14.929																				

1 Duty : 1250 Ha / Cumecs

2 Transmission losses of main canal = 2.25 cumecs / 1000000 sq.m

3 Transmission losses for offtaking canals :

Q>10 cumecs = 45 %

Q>5 cumecs< 10 cumecs = 35 %

Q>1 cumecs< 5 cumecs = 25 %

Q< 1 cumecs = 10 %

N.B. THIS SUPERSEEDS DRG. NO. BLB-1036

Sd/—
S.E Rengali O.E.C.F
CIRCLE. K. Nagar

CHECKED & SUBMITTED

27/3/09

Sd/—
E.E O E C F DIVN V
SUKINDA, DIST JAJPUR

Sd/-
Executive Engineer
Designs Division
SAMAL

TRUE COPY

Executive Engineer
Designs Division
SAMAL

APPROVED
Sd/ 4-9-09
Chief Engineer & Basin Manag
Brahmani Left Basin, Sam.

DRG. NO. BLB.-3179
FILE NO: DDT VI 81/09

Hydropneum Systems, Puri

Demographic pattern of the study area (in DHENKANAL District):

Sl. No.	Village Name	No. of House holds	Population												Percentage	
			Total	Male	Female	SC			ST			0-6 Years				
						Total	Male	Female	Total	Male	Female	Total	Male	Female	SC	ST
1.	Kanaka	100	402	192	210	1	0	1	401	192	209	64	28	36	0.25	99.75
2.	Kankarpur	34	150	83	67	0	0	0	142	79	63	22	14	8	0.00	94.67
3.	Analakata	179	830	427	403	221	111	110	0	0	0	96	52	44	26.63	0.00
4.	Jayapurakateni	450	2036	1034	1002	367	177	190	109	60	49	251	131	120	18.03	5.35
5.	Denga Bahali	79	435	219	216	0	0	0	410	208	202	99	47	52	0.00	94.25
6.	Kenduapada	135	650	309	341	3	2	1	565	267	298	117	56	61	0.46	86.92
7.	Bhuban P.S	22588	101051	51992	49059	20622	10469	10153	9492	4767	4725	11594	6116	5478	20.41	9.39
8.	Odisha	874	4021	2032	1989	782	392	390	725	343	382	477	250	227	19.45	18.03
9	Kumurasinga	131	530	275	255	33	18	15	106	54	52	58	29	29	6.23	20.00
10.	Kuninda	393	1626	804	822	336	172	164	94	53	41	165	85	80	20.66	5.78
11.	Khoksa(L)	71	296	157	139	32	16	16	93	51	42	37	15	22	10.81	31.42
12.	Khoksa(R)	92	333	180	153	0	0	0	0	0	0	41	23	18	0.00	0.00
13.	Baruan	290	1323	669	654	326	147	179	5	3	2	128	71	57	24.64	0.38
14.	Kansaragoda	232	1066	555	511	147	66	81	411	219	192	148	83	65	13.79	38.56
15.	Dhalapada	188	747	386	361	1	0	1	239	113	126	89	47	42	0.13	31.99
16.	Kainsiri	290	1250	642	608	49	25	24	155	74	81	150	70	80	3.92	12.40
17.	Muruga	265	1112	579	533	636	321	315	0	0	0	132	70	80	57.19	0.00
18.	Balijhati	121	569	284	285	22	8	14	131	64	67	59	36	23	3.87	23.02
19.	Anantapur	226	912	492	420	381	202	179	221	121	100	101	67	34	41.78	24.23
20.	Garudabandi	201	931	476	455	183	86	97	320	156	164	113	57	56	19.66	34.37
21.	Nayanilakanthapur	100	448	233	215	50	25	25	0	0	0	38	17	21	11.16	0.00
22.	patapur	107	392	205	187	230	112	118	0	0	0	44	24	20	58.67	0.00
23.	Jaypur	350	1429	733	696	1359	696	663	0	0	0	172	80	92	95.10	0.00
24.	Kingol	145	667	359	308	330	171	159	0	0	0	89	53	36	49.48	0.00
25.	Kirtanpur	312	1240	644	596	693	353	340	0	0	0	159	84	75	55.89	0.00
26.	Bhusala	586	2302	1207	1095	278	143	135	0	0	0	266	151	115	12.08	0.00
27.	Praharajpur	22	102	46	56	38	13	25	0	0	0	14	5	9	37.25	0.00
28.	Kanapalsamilmahulp	760	3600	1866	1734	827	419	408	44	24	20	436	242	194	22.97	1.22

29.	Chandipal	212	1005	510	495	893	457	436	0	0	0	127	66	61	88.86	0.00
30.	Karadabani	239	1115	555	560	199	99	100	147	77	70	167	86	81	17.85	13.18
31.	Kanapal	56	207	114	93	94	50	44	0	0	0	23	14	9	45.41	0.00
32.	Sitalabasa	108	536	268	268	0	0	0	4	3	1	60	22	38	0.00	0.75
33.	Kankana	356	1704	894	810	222	121	101	970	510	460	245	134	111	13.03	56.92
34.	Anala	360	1487	766	721	215	107	108	80	41	39	156	83	73	14.46	5.38
35.	Senanda	46	240	108	132	0	0	0	226	102	124	45	16	29	0.00	94.17
36.	Brahmankhantakhol	44	212	114	98	7	3	4	168	92	76	28	17	11	3.30	79.25
37.	Hariamaru	28	139	73	66	0	0	0	0	0	0	20	11	9	0.00	0.00
38.	Kendupada	176	807	414	393	19	9	10	319	172	147	96	43	53	2.35	39.53
39.	Mathanuagan	186	834	433	401	421	216	205	0	0	0	78	41	37	50.48	0.00
40.	Balipada	2	22	9	13	0	0	0	0	0	0	3	0	3	0.00	0.00
41.	Renadapatana	209	906	473	433	70	28	42	273	137	136	91	49	42	7.73	30.13
42.	Palasapithia	283	1280	646	634	172	84	88	183	89	94	155	82	73	13.44	14.30
43.	Gabagoda	32	165	90	75	0	0	0	110	62	48	12	7	5	0.00	66.67
44.	Solagadia	369	1663	872	791	271	155	116	166	82	84	188	111	77	16.30	9.98
45.	Ichhapur	6	23	9	14	0	0	0	18	7	11	5	2	3	0.00	78.26
46	Basudeipur	121	572	291	281	89	48	41	72	37	35	57	28	29	15.56	12.59
47.	Dayanabili	185	819	405	414	95	45	50	331	159	172	84	36	48	11.60	40.42
48.	Gamargola	19	81	37	44	21	12	9	5	2	3	13	6	7	25.93	6.17
49.	Garhnrusinghaprasad	391	1753	925	828	663	343	320	10	5	5	199	112	87	37.82	0.57
50.	Anlajhari	336	1538	798	740	230	106	124	180	91	89	201	108	93	14.95	11.70
51.	Kankhai	154	720	368	352	78	35	43	274	133	141	96	43	53	10.83	38.06
52.	Kesharpur	110	500	264	236	19	10	9	230	126	104	68	38	30	3.80	46.00
53.	Balibo(L)	568	2573	1333	1240	584	304	280	127	58	69	266	157	109	22.70	4.94
54.	Samal	109	541	255	286	16	7	9	0	0	0	67	26	41	2.96	0.00
55.	Tipilei	258	1162	603	559	118	60	58	468	236	232	141	74	67	10.15	40.28
56.	Chhatakhamb	5	12	7	5	0	0	0	6	4	2	0	0	0	0.00	50.00
57.	Kumarda	63	237	118	119	0	0	0	237	118	119	42	14	28	0.00	100.00
58.	Dadhisinga	20	100	48	52	0	0	0	100	48	52	24	11	13	0.00	100.00
60.	Naraharipur	63	237	119	118	76	42	34	19	8	11	28	14	14	32.07	8.02
61.	Surapratappur	1254	5776	3012	2764	831	432	399	4	3	1	675	388	287	14.39	0.07

62.	Kunda	240	1230	640	590	153	78	75	0	0	0	168	95	73	12.44	0.00
63.	Sundhikateni	213	1023	521	502	71	33	38	182	90	92	137	74	63	6.94	17.79
64.	Kanchanbahali	72	311	155	156	9	4	5	302	151	151	81	42	39	2.89	97.11
65.	Asurabandha	293	1173	594	579	385	180	205	171	90	81	163	78	85	32.82	14.58
66.	Arilo	16	78	44	34	0	0	0	78	44	34	18	11	7	0.00	100.00
67.	Gadganpur	276	1122	568	554	115	52	63	12	5	7	119	56	63	10.25	1.07
68.	Chandar	218	941	454	487	173	80	93	0	0	0	112	61	51	18.38	0.00
69.	Gopalpur	189	740	407	333	0	0	0	0	0	0	76	47	29	0.00	0.00
70.	Gobindabidyadharpur	24	92	48	44	92	48	44	0	0	0	13	7	6	100.00	0.00
71.	Malapura	434	1807	903	904	260	118	142	445	215	230	200	95	105	14.39	24.63
72.	Nimeinpur	236	987	471	516	55	31	24	0	0	0	112	53	59	5.57	0.00
73.	Rodanga	29	125	70	55	125	70	55	0	0	0	26	16	10	100.00	0.00
74.	Asurabandha Patana	202	926	472	454	642	327	315	0	0	0	130	62	68	69.33	0.00
75.	Mrudanga	580	2716	1430	1286	1046	547	499	218	105	113	342	193	149	38.51	8.03
76.	Bentashalia	96	368	190	178	85	41	44	0	0	0	41	25	16	23.10	0.00
77.	Ekatali(Kha)	477	2009	995	1014	432	212	220	24	12	12	242	121	121	21.50	1.19
78.	Ekatali(Ka)	24	101	57	44	30	17	13	0	0	0	8	3	5	29.70	0.00
79.	Brahmapur	25	111	62	49	24	14	10	0	0	0	13	7	6	21.62	0.00
80.	Majhipal	99	496	250	246	0	0	0	489	246	243	124	59	65	0.00	98.59
81.	Nilakanthapur	230	1023	547	476	459	262	197	0	0	0	131	79	52	44.87	0.00
82.	Sarangapur	20	97	48	49	0	0	0	4	3	1	9	4	5	0.00	4.12
83.	Hatibari	125	501	252	249	430	221	209	58	26	32	67	33	34	85.83	11.58
84.	Purastampur	265	1216	610	606	163	82	81	0	0	0	131	64	67	13.40	0.00
85.	Koriapal	190	1087	506	581	87	18	69	656	319	337	142	57	85	8.00	60.35
86.	Darjani	175	802	433	369	67	42	25	155	87	68	90	50	40	8.35	19.33
87.	Maluagoda	115	492	228	264	64	31	33	427	196	231	70	25	45	13.01	86.79
88.	Joragadia	17	85	47	38	0	0	0	85	47	38	19	9	10	0.00	100.00
89.	Kankadahad	458	2114	1090	1024	445	227	218	636	316	320	275	148	127	21.05	30.09

In JAJPUR District

Sl. No.	Village Name	No.of House holds	Population												Percentage	
			Total	Male	Female	SC			ST			0-6 Years				
						Total	Male	Female	Total	Male	Female	Total	Male	Female	SC	ST
1	Ichhapur	132	630	329	301	135	73	62	0	0	0	80	41	39	21.43	0.00
2	Jalanda	145	673	361	312	274	149	125	0	0	0	85	50	35	40.71	0.00
3	Tarrakote	608	2875	1441	1434	675	347	328	10	3	7	309	160	149	23.48	0.35
4	Barada	232	1188	637	551	356	189	167	1	1	0	123	69	54	29.97	0.08
5	Tentulikhunta	113	563	292	271	179	92	87	2	2	0	78	43	35	31.79	0.36
6	Kayan	189	828	428	400	315	160	155	136	69	67	97	49	48	38.04	16.4
7	Tulati	245	1105	567	538	460	238	222	4	2	2	142	75	67	41.63	0.36
8	Pimpal	106	482	230	252	106	56	50	0	0	0	61	26	35	21.99	0.00
9	Jaintala	58	293	146	147	6	2	4	42	22	20	30	17	13	2.05	14.33
10	Toranda	87	449	234	215	55	31	24	0	0	0	32	16	16	12.25	0.00
11	Solabandi	262	1108	567	541	79	40	39	3	1	2	137	73	64	7.13	0.27
12	Chingudipur	36	178	100	78	16	12	4	0	0	0	27	20	7	8.99	0.00
13	Haladigadia	322	1626	822	804	285	140	145	0	0	0	191	95	96	17.53	0.00
14	Kogan	105	459	236	223	177	91	86	0	0	0	45	26	19	38.56	0.00
15	Talagadia	140	855	477	378	220	120	100	280	172	108	106	77	29	25.73	32.7
16	Asanjhar	228	1040	526	514	172	87	85	565	271	294	129	67	62	16.54	54.33
17	Ranapur	255	1287	646	641	217	108	109	0	0	0	171	89	82	16.86	0.00
18	Gajendrapur	184	757	405	352	186	103	83	0	0	0	88	53	35	24.57	0.00
19	Jugala	156	717	373	344	191	90	101	0	0	0	65	30	35	26.64	0.00
20	Mathurapur	190	821	418	403	156	77	79	283	148	135	102	53	49	19.00	34.47
21	Nisankhapur	49	224	111	113	80	44	36	0	0	0	30	16	14	35.71	0.00
22	Salaba	125	572	297	275	164	85	79	15	9	6	96	58	38	28.67	2.62
23	Barundai	726	3250	1640	1610	855	436	419	93	47	46	377	184	193	26.31	2.86
24	Bangarakota	444	1743	930	813	429	230	199	1	1	0	176	110	66	24.61	0.06
25	Khiro	204	896	471	425	162	84	78	196	104	92	96	57	39	18.08	21.88

26	Banhara	54	277	133	144	55	20	35	0	0	0	28	13	15	19.86	0.00
27	Amrutia	433	2250	1107	1143	544	256	288	215	105	110	288	136	152	24.18	9.56
28	Mulapal	165	797	419	378	178	90	88	162	87	75	110	60	50	22.33	20.33
29	Kantigadia	243	1225	626	599	291	148	143	0	0	0	127	68	59	23.76	0.00
30	Sathipur	333	1765	908	857	296	152	144	15	8	7	182	83	99	16.77	0.85
31	Balipasi	98	475	248	227	2	1	1	0	0	0	56	28	28	0.42	0.00
32	Manipur	105	499	260	239	211	116	95	26	12	14	58	29	29	42.28	5.21
33	Panikoili P.S	13399	65386	33539	3184	1700	867	8322	313	161	152	7566	391	365	26.00	4.80
34	Harichandpur	32	151	81	70	49	26	23	0	0	0	20	13	7	32.45	0.00
35	Mirjapur	489	2089	1030	1059	804	403	401	0	0	0	239	131	108	38.49	0.00
36	Ambatola	69	318	164	154	77	37	40	0	0	0	37	19	18	24.21	0.00
37	Solapatta	194	960	490	470	379	188	191	0	0	0	116	67	49	39.48	0.00
38	Radhanagar	11	46	24	22	20	11	9	7	4	3	7	3	4	43.48	15.22
39	Thakurpatana	265	1347	695	652	567	299	268	0	0	0	139	74	65	42.09	0.00
40	Santarapur	223	1184	592	592	28	14	14	632	301	331	221	105	116	2.36	53.38
41	Talugan	143	636	326	310	159	79	80	58	29	29	80	43	37	25.00	9.12
42	Dhaneswar	301	1381	700	681	480	240	240	0	0	0	197	101	96	34.76	0.00
43	Balia Pasi	58	299	148	151	7	4	3	18	8	10	26	16	10	2.34	6.02
44	Chakua	124	522	275	247	64	31	33	0	0	0	61	35	26	12.26	0.00
45	Marutikar	417	2004	1028	976	1503	769	734	2	1	1	312	168	144	75.00	0.10
46	Damodarpur	11	42	19	23	42	19	23	0	0	0	6	2	4	100.0	0.00
47	Kumbhirigadia	353	1664	869	795	553	288	265	61	32	29	194	111	83	33.23	3.67
48	Jakhapura P.S	3745	17424	8799	8625	3992	199	2001	267	133	134	2308	115	115	22.91	15.35
49	Boulanga	237	1138	559	579	308	151	157	0	0	0	127	57	70	27.07	0.00
50	Mangalpur	470	2140	1080	1060	213	108	105	990	488	502	361	185	176	9.95	46.26
51	Telibedha	59	271	144	127	66	34	32	0	0	0	25	7	18	24.35	0.00
52	Nuagan	117	481	248	233	5	3	2	320	164	156	73	39	34	1.04	66.53
53	Ollala	212	1073	553	520	874	441	433	190	108	82	167	84	83	81.45	17.71
54	Mulasar	188	993	515	478	987	512	475	0	0	0	125	65	60	99.40	0.00
55	Dankari	215	949	465	484	342	166	176	318	159	159	130	67	63	36.04	33.51
56	Kusunpur	94	408	216	192	186	100	86	17	7	10	52	29	23	45.59	4.17
57	Tikarapada	307	1539	776	763	192	107	85	96	51	45	176	91	85	12.48	6.24

58	Nandakishore Pur	117	548	279	269	28	15	13	0	0	0	52	28	24	5.11	0.00
59	Ranipada	159	761	403	358	145	73	72	67	39	28	80	51	29	19.05	8.80
60	Dhuligarh	576	2542	1269	1273	234	122	112	167	816	854	499	245	254	9.21	65.70
61	Dhabahali	67	315	163	152	0	0	0	278	143	135	63	35	28	0.00	88.25
62	Jhatiasahi	26	132	68	64	60	33	27	0	0	0	16	11	5	45.45	0.00
63	Jajpur Sadar P.S	28034	127778	65202	62576	33847	17399	16448	994	490	504	14163	7396	6767	26.49	0.78
64	Janara	81	399	200	199	18	9	9	68	34	34	47	27	20	4.51	17.04
65	Jhumpan	81	381	198	183	226	118	108	0	0	0	54	29	25	59.32	0.00
66	Upulei	179	772	398	374	327	166	161	0	0	0	76	37	39	42.36	0.00
67	Sadakpur	364	1798	909	889	118	59	59	0	0	0	202	104	98	6.56	0.00
68	Korai P.S	20561	96874	49208	4766	2615	133	1284	916	463	453	11586	607	550	27.00	9.46
69	Santarapur	223	1184	592	592	28	14	14	632	301	331	221	105	116	2.36	53.38
70	Panasua	29	155	76	79	0	0	0	0	0	0	22	14	8	0.00	0.00
71	Khamigan	204	992	499	493	649	324	325	0	0	0	148	76	72	65.42	0.00
72	Pataranga	347	1710	864	846	346	161	185	183	92	91	233	131	102	20.23	10.70
73	Dhanapur	177	898	451	447	142	70	72	0	0	0	114	50	64	15.81	0.00
74	Korabandi	366	1690	861	829	561	288	273	143	73	70	189	119	70	33.20	8.46
75	Ragada	460	2180	1117	1063	1147	590	557	974	495	479	389	203	186	52.61	44.68
76	Kantore	249	1232	639	593	343	179	164	0	0	0	138	84	54	27.84	0.00
77	Mantira	153	684	350	334	136	65	71	49	25	24	73	42	31	19.88	7.16
78	Bhatasolapat	141	655	338	317	366	181	185	0	0	0	82	42	40	55.88	0.00
79	Janara	81	399	200	199	18	9	9	68	34	34	47	27	20	4.51	17.04
80	Mangobindapur	560	2285	1203	1082	298	148	150	551	288	263	338	177	161	13.04	24.11
81	Kacheri Gan	153	706	348	358	0	0	0	697	342	355	151	77	74	0.00	98.73
82	Uparagarh	70	324	168	156	65	33	32	209	111	98	44	23	21	20.06	64.51
83	Kantia	539	2020	965	1055	1129	545	584	1	0	1	232	117	115	55.89	0.05
84	Barakhai	210	959	496	463	436	217	219	224	118	106	121	58	63	45.46	23.36
85	Nadia Bhanga	437	2280	1199	1081	474	243	231	802	409	393	428	211	217	20.79	35.18
86	Khandia Bandi	105	505	240	265	18	10	8	231	100	131	50	22	28	3.56	45.74

87	Madhapur	100	427	238	189	145	77	68	0	0	0	33	22	11	33.96	0.00
88	Sarangapur	404	1745	899	846	247	130	117	834	430	404	280	157	123	14.15	47.79
89	Champa	89	390	190	200	220	104	116	0	0	0	53	26	27	56.41	0.00
90	Khurunti	525	1977	1001	976	434	228	206	123	623	610	373	175	198	21.95	62.37
91	Gobara Ghati	1042	4964	2553	2411	113	68	45	410	211	198	888	488	400	2.28	82.72
92	Chandia	291	1299	625	674	7	3	4	128	617	665	265	137	128	0.54	98.69
93	Ankura Pal	187	951	452	499	0	0	0	940	447	493	202	91	111	0.00	98.84
94	Ramachandrapur	132	613	314	299	73	38	35	136	70	66	70	40	30	11.91	22.19
95	Nilamanidei Pursasan	155	722	372	350	3	1	2	0	0	0	67	35	32	0.42	0.00
96	Digambarpur	81	413	214	199	2	1	1	0	0	0	44	24	20	0.48	0.00
97	Sana Pingal	66	372	195	177	0	0	0	0	0	0	35	20	15	0.00	0.00
98	Bada Pingal	365	1937	1017	920	141	77	64	0	0	0	247	133	114	7.28	0.00
99	Nimapali	488	2395	1234	1161	381	197	184	702	354	348	368	189	179	15.91	29.31
100	Golagan	300	1438	744	694	74	33	41	689	361	328	276	146	130	5.15	47.91
101	Baghuapal	163	1000	429	571	57	28	29	941	399	542	213	108	105	5.70	94.10
102	Bharada Pasi	73	383	186	197	0	0	0	381	185	196	79	38	41	0.00	99.48
103	Kantira	283	1448	750	698	1311	684	627	0	0	0	196	109	87	90.54	0.00
104	Atta	696	3246	1653	1593	961	489	472	63	34	29	415	209	206	29.61	1.94
105	Bartanda	470	2431	1288	1143	503	279	224	3	1	2	257	150	107	20.69	0.12
106	Bahabalpur	171	789	394	395	33	17	16	0	0	0	93	40	53	4.18	0.00
107	Haripur	749	3671	1927	1744	309	158	151	10	5	5	399	231	168	8.42	0.27
108	Gahira Patuli	96	388	197	191	380	192	188	0	0	0	47	22	25	97.94	0.00
109	Hatibari	827	4064	2027	2037	1073	524	549	63	15	48	461	232	229	26.40	1.55
110	Karadapal	98	534	281	253	2	1	1	0	0	0	68	38	30	0.37	0.00
111	Bairimal	384	1953	1013	940	140	65	75	0	0	0	228	114	114	7.17	0.00
112	Bhalukipatala	195	1173	619	554	102	48	54	424	240	184	174	86	88	8.70	36.15
113	Garamian	333	1873	962	911	3	2	1	181	935	882	298	146	152	0.16	97.01
114	Kankadapal	203	1042	523	519	168	83	85	152	77	75	93	45	48	16.12	14.59
115	Bambilo	392	2117	1102	1015	247	132	115	374	192	182	251	129	122	11.67	17.67
116	Botalanda	501	2331	1191	1140	115	60	55	571	283	288	312	167	145	4.93	24.50

117	Kuhika	281	1350	697	653	14	9	5	685	346	339	159	92	67	1.04	50.74
118	Gandhapal	224	1207	625	582	120	71	49	139	69	70	128	59	69	9.94	11.52
119	Mulakhamba	92	445	223	222	235	119	116	209	103	106	72	29	43	52.81	46.97
120	Nuadihi	121	671	328	343	36	18	18	51	23	28	71	31	40	5.37	7.60
121	Manatira	574	2673	1318	1355	415	198	217	250	124	126	322	149	173	15.53	9.35
122	Barabati	294	1236	610	626	120	58	62	32	17	15	128	67	61	9.71	2.59
123	Mangalpur	470	2140	1080	1060	213	108	105	990	488	502	361	185	176	9.95	46.26
124	Uchabali	304	1435	714	721	43	20	23	333	170	163	150	75	75	3	23.20
125	Badabil	109	479	252	227	15	7	8	46	22	24	36	15	21	3.13	9.60
126	Kumbhanagara	73	335	168	167	110	50	60	0	0	0	26	12	14	32.84	0.00
127	Gouda Bahali	80	404	209	195	5	2	3	97	53	44	39	16	23	1.24	24.01
128	Ragadi	243	1304	702	602	276	154	122	31	27	4	144	67	77	21.17	2.38
129	Tura	59	266	129	137	12	7	5	9	5	4	20	9	11	4.51	3.38
130	Tarailo	219	1087	550	537	132	68	64	91	46	45	129	58	71	12.14	8.37
131	Nachhipura	434	1895	981	914	489	244	245	221	119	102	234	123	111	25.80	11.66
132	Kharadabandi	146	704	357	347	15	3	12	198	94	104	74	33	41	2.13	28.13
133	Chitri	834	3759	1902	1857	385	204	181	101	491	519	559	285	274	10.24	26.87
134	Salijanga	692	3062	1561	1501	397	202	195	125	638	612	416	243	173	12.97	40.82
135	Godarapal	71	349	168	181	33	13	20	159	77	82	36	18	18	9.46	45.56
136	Routpada	208	982	489	493	214	99	115	324	162	162	141	78	63	21.79	32.99
137	Andhari	258	992	500	492	268	145	123	118	53	65	99	51	48	27.02	11.90
138	Kadama	518	2211	1102	1109	214	107	107	932	465	467	261	133	128	9.68	42.15
139	Kiapada	323	1440	727	713	475	246	229	303	143	160	175	87	88	32.99	21.04
140	Gopalpur	74	444	235	209	125	65	60	16	11	5	56	31	25	28.15	3.60
141	Raghupur	71	375	198	177	0	0	0	0	0	0	42	22	20	0.00	0.00
142	Ramakrishnap	139	647	326	321	171	88	83	0	0	0	72	36	36	26.43	0.00
143	Belada	50	265	135	130	70	33	37	0	0	0	19	11	8	26.42	0.00
144	Mahulia	106	567	287	280	304	146	158	0	0	0	57	36	21	53.62	0.00
145	Paramanandap	234	1246	640	606	154	77	77	98	67	31	135	68	67	12.36	7.87
146	Aranto	2	10	6	4	0	0	0	0	0	0	2	1	1	0.00	0.00

147	Patarakana	112	552	268	284	185	90	95	42	18	24	69	38	31	33.51	7.61
148	Sampur	22	97	55	42	56	31	25	0	0	0	11	7	4	57.73	0.00
149	Sanla	192	906	446	460	244	110	134	257	139	118	71	29	42	26.93	28.37
150	Kacharasahi	281	1372	697	675	98	52	46	0	0	0	131	82	49	7.14	0.00
151	Bachhipur	90	488	248	240	0	0	0	0	0	0	68	28	40	0.00	0.00
152	Sitalgobindpur	81	375	184	191	0	0	0	173	86	87	34	18	16	0.00	46.13
153	Pachhikote	230	1157	581	576	602	309	293	173	81	92	151	76	75	52.03	14.95
154	Sunachara	34	155	81	74	32	16	16	0	0	0	20	12	8	20.65	0.00
155	Nayahatpatna	107	433	222	211	149	68	81	0	0	0	46	20	26	34.41	0.00
156	Mukundapur	628	2974	1512	1462	731	368	363	241	131	110	369	199	170	24.58	8.10
157	Ranagundi	353	1564	811	753	341	169	172	696	355	341	218	124	94	21.80	44.50
158	Tulasipur	203	934	453	481	151	80	71	5	3	2	104	51	53	16.17	0.54
159	Gourpur	133	614	310	304	245	133	112	27	13	14	80	42	38	39.90	4.40
160	Baliapal	471	2293	1139	1154	19	7	12	152	736	786	449	227	222	0.82	6.62
161	Sulia	276	1233	601	632	4	3	1	607	282	325	218	107	111	0.32	49.23
162	Sahaspur	35	201	96	105	6	2	4	0	0	0	23	11	12	2.99	0.00
163	Purbakote	206	1059	545	514	660	342	318	26	15	11	161	83	78	62.32	2.46
164	Khosalpur	57	262	125	137	163	73	90	0	0	0	34	17	17	62.21	0.00
165	Narendrabhog	43	219	114	105	94	53	41	0	0	0	21	11	10	42.92	0.00
166	Manjuri	37	183	87	96	126	56	70	0	0	0	21	13	8	68.85	0.00
167	Talia	34	150	80	70	0	0	0	0	0	0	11	7	4	0.00	0.00
168	Gohiragadia	232	1180	595	585	215	111	104	416	212	204	149	71	78	18.22	35.25
169	Asanagadia	111	506	243	263	3	0	3	394	187	207	77	38	39	0.59	77.87
170	Gayalgadia	28	136	74	62	136	74	62	0	0	0	23	16	7	100.0	0.00
171	Biridiha	86	389	195	194	110	53	57	1	0	1	27	16	11	28.28	0.26
172	Barahampur	106	467	223	244	150	77	73	209	98	111	65	34	31	32.12	44.75
173	Solapatia	92	411	201	210	177	85	92	0	0	0	40	19	21	43.06	0
174	Gamharia	170	733	358	375	193	97	96	194	96	98	80	36	44	26.33	26.47
175	Oshala	253	1065	537	528	323	163	160	0	0	0	132	74	58	30.33	0.00
176	Rampilo	262	1197	613	584	1136	586	550	0	0	0	194	114	80	94.90	0.00

177	Godigotha	222	1145	563	582	705	359	346	406	191	215	237	117	120	61.57	35.46
178	Bainsipur	33	163	83	80	75	36	39	0	0	0	15	7	8	46.01	0.00
179	Jaintira	37	159	82	77	0	0	0	0	0	0	16	8	8	0.00	0.00
180	Aranyamadana	94	460	240	220	18	8	10	173	86	87	45	24	21	3.91	37.61
181	Mandapada	44	223	101	122	133	60	73	83	37	46	32	13	19	59.64	37.22
182	Jalapatipur	31	141	69	72	0	0	0	0	0	0	14	6	8	0.00	0.00
183	Pimpudia	508	2461	1272	1189	29	15	14	120	620	585	421	220	201	1.18	48.96
184	Sahagan	134	586	301	285	125	59	66	133	62	71	76	42	34	21.33	22.70
185	Uttarkota	33	160	73	87	28	12	16	0	0	0	23	10	13	17.50	0.00
186	Biruanpada	61	276	129	147	21	9	12	0	0	0	22	11	11	7.61	0.00
187	Mangarajpur	62	345	172	173	0	0	0	0	0	0	33	13	20	0.00	0.00
188	Uttarakhajira	78	418	209	209	139	71	68	0	0	0	48	27	21	33.25	0.00
189	Kantapal	61	308	145	163	0	0	0	128	66	62	37	13	24	0.00	41.56
190	Baragadia	496	2323	1191	1132	638	321	317	97	49	48	273	134	139	27.46	4.18
191	Ambapal	167	820	404	416	31	17	14	563	271	292	115	54	61	3.78	68.66
192	Nigodha	80	384	191	193	120	61	59	0	0	0	42	22	20	31.25	0.00
193	Chhanchania	13	63	35	28	11	6	5	0	0	0	6	6	0	17.46	0.00
194	Sansailo	644	2903	1490	1413	811	410	401	271	135	136	458	236	222	27.94	9.34
195	Gorakhapur	21	101	52	49	101	52	49	0	0	0	11	4	7	100.0	0.00
196	Pandiapada	7	39	19	20	0	0	0	0	0	0	3	2	1	0.00	0.00
197	Khaira	75	341	172	169	51	25	26	133	70	63	35	20	15	14.96	39.00
198	Bandalo	688	3396	1660	1736	886	430	456	8	4	4	381	188	193	26.09	0.24
199	Jagulaigadia	139	625	309	316	205	101	104	0	0	0	66	25	41	32.80	0.00
200	Kankadajhar	118	571	301	270	478	249	229	0	0	0	72	44	28	83.71	0.00
201	Duburi	985	4279	2145	2134	333	173	160	113	529	610	552	252	300	7.78	26.62
202	Santasahi	273	1303	662	641	158	77	81	0	0	0	140	84	56	12.13	0.00
203	Bandhagan	367	1928	938	990	29	17	12	771	342	429	315	162	153	1.50	39.99
204	Kaduabandi	202	995	517	478	145	79	66	132	69	63	104	54	50	14.57	13.27
205	Saransa	66	265	143	122	22	11	11	185	98	87	28	13	15	8.30	69.81
206	Khajurinalua	122	538	268	270	165	84	81	0	0	0	62	29	33	30.67	0.00

207	Gobaragali	22	109	54	55	16	6	10	0	0	0	10	5	5	14.68	0.00
208	Gopinathpur	76	377	187	190	84	40	44	2	1	1	55	27	28	22.28	0.53
209	Jemadeipur	82	509	249	260	0	0	0	493	245	248	116	50	66	0.00	96.86
210	Khajuribindha	12	56	27	29	56	27	29	0	0	0	4	1	3	100.0	0.00
211	Kaliapal	79	380	191	189	379	191	188	0	0	0	46	23	23	99.74	0.00
212	Galiachhanda	134	612	312	300	53	25	28	129	67	62	88	42	46	8.66	21.08
213	Raghunathpur	49	225	117	108	20	10	10	0	0	0	25	14	11	8.89	0.00
214	Arjunjhar	81	429	209	220	131	63	68	277	135	142	87	43	44	30.54	64.57
215	Sundarapokhari	85	378	197	181	87	38	49	3	1	2	37	15	22	23.02	0.79
216	Rahemanpur	183	849	424	425	425	220	205	13	4	9	90	43	47	50.06	1.53
217	Akhanpur	69	275	145	130	54	33	21	149	74	75	35	14	21	19.64	54.18
218	Baragaji	121	598	307	291	0	0	0	596	306	290	117	70	47	0.00	99.67
219	Routapada	98	411	203	208	146	82	64	0	0	0	36	16	20	35.52	0.00
220	Kantipur	131	649	336	313	628	324	304	8	7	1	106	56	50	96.76	1.23
221	Kusumundia	130	653	327	326	52	26	26	555	279	276	92	59	33	7.96	84.99
222	Gantayatkateni	89	461	232	229	0	0	0	416	208	208	84	51	33	0.00	90.24
223	Ashokjhar	156	719	361	358	227	114	113	410	206	204	112	55	57	31.57	57.02
224	Dhapanki	87	390	198	192	390	198	192	0	0	0	60	30	30	100.0	0.00
225	Kankadagadia	6	18	11	7	5	2	3	0	0	0	3	3	0	27.78	0.00
226	Krishnapur	97	390	202	188	0	0	0	0	0	0	41	24	17	0.00	0.00
227	Bhalukipatala	195	1173	619	554	102	48	54	424	240	184	174	86	88	8.70	36.15
228	Mohammadhosenpur	106	518	263	255	96	47	49	308	160	148	69	41	28	18.53	59.46
229	Itapur	14	69	36	33	11	6	5	0	0	0	8	5	3	15.94	0.00
230	Bagira	34	176	93	83	34	17	17	0	0	0	18	11	7	19.32	0.00
231	Dudhajori	215	1075	555	520	44	22	22	423	225	198	140	74	66	4.09	39.35
232	Naguan	111	566	274	292	76	40	36	10	5	5	55	29	26	13.43	1.77
233	Padi	67	289	154	135	172	93	79	0	0	0	44	22	22	59.52	0.00
234	Tarapada	66	337	165	172	152	68	84	0	0	0	41	16	25	45.10	0.00
235	Taharpur	218	1053	559	494	359	185	174	24	17	7	136	76	60	34.09	2.28

236	Nayagarh	107	478	262	216	205	111	94	9	4	5	40	23	17	42.89	1.88
237	Sarasada	166	735	380	355	257	124	133	0	0	0	85	42	43	34.97	0.00
238	Salakana	76	322	159	163	23	14	9	5	2	3	27	16	11	7.14	1.55
239	Barighodha	213	1048	509	539	36	17	19	73	34	39	118	59	59	3.44	6.97
240	Hatimunda	14	50	24	26	0	0	0	11	5	6	8	4	4	0.00	22.00
241	Kandaragadia	30	142	77	65	108	58	50	0	0	0	16	10	6	76.06	0.00
242	Olia	253	1153	595	558	209	116	93	190	90	100	159	84	75	18.13	16.48
243	Banahara	13	75	39	36	0	0	0	0	0	0	9	5	4	0.00	0.00
244	Sainto	55	317	164	153	301	156	145	0	0	0	45	25	20	94.95	0.00
245	Kankadapal	203	1042	523	519	168	83	85	152	77	75	93	45	48	16.12	14.59
246	Sisua	24	103	51	52	67	32	35	4	2	2	15	9	6	65.05	3.88
247	Abhayapur	187	916	472	444	123	61	62	356	178	178	137	69	68	13.43	38.86
248	Mulasaragada	100	484	259	225	64	32	32	25	15	10	54	32	22	13.22	5.17
249	Bantala	67	326	168	158	102	52	50	0	0	0	29	15	14	31.29	0.00
250	Fazalpur	644	3078	1595	1483	389	204	185	13	6	7	429	231	198	12.64	0.42
251	Rangaranga	203	963	490	473	131	72	59	195	89	106	112	49	63	13.60	20.25
252	Khilipankha	123	544	274	270	112	59	53	0	0	0	69	39	30	20.59	0.00
253	Nizigarh	1286	6269	3190	3079	727	371	356	153	788	748	798	402	396	11.60	24.50
254	Kuanrada	116	557	280	277	8	4	4	274	141	133	82	41	41	1.44	49.19
255	Gadapur	80	366	191	175	0	0	0	366	191	175	56	29	27	0.00	100.0
256	Brahmanda	64	312	149	163	151	72	79	2	0	2	43	20	23	48.40	0.64
257	Sukaran	319	1500	757	743	155	84	71	993	487	506	304	165	139	10.33	66.20
258	Aladajalasarpur	273	1180	593	587	398	205	193	179	79	100	174	79	95	33.73	15.17
259	Barapal	64	284	131	153	2	1	1	219	103	116	64	25	39	0.70	77.11
260	Damodar pur	526	2358	1239	1119	338	173	165	474	247	227	292	158	134	14.33	20.10
261	Palasa	113	483	241	242	89	44	45	102	48	54	64	27	37	18.43	21.12
262	Ranasarapur	99	478	238	240	331	166	165	0	0	0	62	32	30	69.25	0.00
263	Baladia	62	318	164	154	91	48	43	75	35	40	42	21	21	28.62	23.58
264	Jamupasi	373	1565	817	748	287	155	132	236	117	119	196	103	93	18.34	15.08
265	Bhakandari	207	1024	529	495	332	176	156	224	118	106	138	77	61	32.42	21.88

266	Baghanata	31	177	87	90	0	0	0	0	0	0	21	9	12	0.00	0.00
267	Kanchichua	116	622	310	312	83	45	38	355	173	182	119	68	51	13.34	57.07
268	Kharajabatira	176	769	392	377	269	136	133	16	7	9	103	58	45	34.98	2.08
269	Mangal Pur	313	1445	749	696	247	131	116	376	203	173	203	103	100	17.09	26.02
270	Adhagan	48	329	173	156	166	91	75	0	0	0	50	28	22	50.46	0.00
271	Bartamana	172	775	369	406	304	156	148	0	0	0	94	39	55	39.23	0.00
272	Mrutunjayapur	399	1674	887	787	799	428	371	4	1	3	181	105	76	47.73	0.24
273	Depada	20	115	60	55	115	60	55	0	0	0	13	4	9	100.0	0.00
274	Ranigoda	291	1569	824	745	305	148	157	20	10	10	198	93	105	19.44	1.27
275	Gobindapur	138	696	363	333	65	35	30	180	96	84	76	43	33	9.34	25.86
276	Mirigi Chara	221	977	488	489	0	0	0	905	451	454	221	114	107	0.00	92.63
277	Sata Bainsia	50	235	106	129	0	0	0	44	17	27	22	9	13	0.00	18.72
278	Pubal	198	858	465	393	160	84	76	618	340	278	143	84	59	18.65	72.03
279	Jakha Pura	853	4152	2152	2000	887	456	431	13	9	4	472	250	222	21.36	0.31
280	Ochinda	101	502	252	250	86	40	46	0	0	0	57	35	22	17.13	0.00
281	Ampolaba	285	1258	649	609	500	256	244	178	93	85	164	85	79	39.75	14.15
282	Ranapal	226	966	500	466	87	50	37	326	171	155	98	46	52	9.01	33.75
283	Khaira dihi	259	1078	564	514	195	102	93	1	1	0	111	64	47	18.09	0.09
284	Begana	100	416	211	205	117	60	57	37	18	19	58	31	27	28.13	8.89
285	Chillipada	64	328	177	151	165	85	80	3	1	2	27	14	13	50.30	0.91
286	Gunduchi pasi	194	939	466	473	0	0	0	699	340	359	148	78	70	0.00	74.44
287	Mulari	101	516	264	252	170	83	87	26	20	6	76	51	25	32.95	5.04
288	Karada	550	2651	1334	1317	534	270	264	61	29	32	319	154	165	20.14	2.30
289	Khosalapur	24	102	58	44	22	15	7	0	0	0	7	5	2	21.57	0.00
290	Barapada	72	368	175	193	342	164	178	0	0	0	50	22	28	92.93	0.00
291	Balunga Bandi	193	1005	501	504	481	239	242	107	51	56	139	65	74	47.86	10.65
292	Taja Pur	139	622	302	320	93	45	48	146	65	81	99	43	56	14.95	23.47
293	Benapur	52	269	144	125	93	47	46	108	62	46	44	27	17	34.57	40.15
294	Khasa Gadia	88	435	221	214	236	112	124	58	29	29	54	33	21	54.25	13.33
295	Brajanagar	142	690	371	319	163	92	71	26	16	10	89	44	45	23.62	3.77

296	Kharadi	320	1538	789	749	131	68	63	560	276	284	232	124	108	8.52	36.41
297	Bada barunei pada	122	620	326	294	40	20	20	153	81	72	109	62	47	6.45	24.68
298	Janha	449	2189	1133	1056	258	145	113	73	38	35	249	142	107	11.79	3.33
299	Ghikoili	43	191	92	99	0	0	0	172	82	90	22	12	10	0.00	90.05
300	Pathara Pada	482	2087	1096	991	98	50	48	432	228	204	226	128	98	4.70	20.70
301	Taluri	100	372	184	188	120	59	61	31	16	15	49	24	25	32.26	8.33
302	Dasamania	211	1061	519	542	661	314	347	224	113	111	160	80	80	62.30	21.11
303	Pancha Batia	12	51	27	24	0	0	0	0	0	0	4	2	2	0.00	0.00
304	Badasulidiha	332	1555	759	796	340	166	174	467	231	236	241	120	121	21.86	30.03
305	Rachhi Pur	537	2574	1318	1256	541	270	271	108	53	55	299	188	111	21.02	4.20
306	Chhotara Pur	215	1125	598	527	169	87	82	26	16	10	127	67	60	15.02	2.31
307	Nuapada	79	412	218	194	63	35	28	0	0	0	37	20	17	15.29	0.00
308	Ambasara	239	1202	572	630	148	72	76	638	289	349	210	91	119	12.31	53.08
309	Rudhia	183	873	448	425	303	152	151	27	13	14	115	56	59	34.71	3.09
310	Oupada	44	190	97	93	15	5	10	0	0	0	17	3	14	7.89	0.00
311	Janha Kana	97	559	276	283	150	74	76	48	22	26	94	51	43	26.83	8.59
312	Tailada	22	82	40	42	7	3	4	19	9	10	9	5	4	8.54	23.17
313	Bajarapada	54	236	119	117	0	0	0	0	0	0	29	14	15	0.00	0.00
314	Mohammed Jamalpur	146	601	307	294	222	113	109	21	14	7	70	33	37	36.94	3.49
315	Raitikar	160	861	416	445	88	45	43	0	0	0	113	49	64	10.22	0.00
316	Alatiri	539	2794	1441	1353	612	308	304	25	14	11	302	164	138	21.90	0.89
317	Khaira Bad	49	223	105	118	84	38	46	0	0	0	24	14	10	37.67	0.00
318	Nara Pada	127	645	342	303	234	125	109	81	41	40	87	51	36	36.28	12.56
319	Kuru Pada	151	698	365	333	292	153	139	6	3	3	95	43	52	41.83	0.86
320	Rabana	485	2018	1019	999	591	299	292	212	100	112	276	136	140	29.29	10.51
321	Bhiki Pur	159	718	361	357	133	68	65	13	6	7	84	39	45	18.52	1.81
322	Manohar Pur	426	1852	956	896	367	187	180	285	140	145	255	131	124	19.82	15.39
323	Dania Bar	347	1701	888	813	1005	515	490	0	0	0	217	114	103	59.08	0.00
324	Badhei Tikar	97	497	241	256	133	62	71	0	0	0	41	26	15	26.76	0.00
325	Hetagadia	36	178	89	89	45	18	27	0	0	0	18	11	7	25.28	0.00

326	Soti	368	1787	945	842	563	298	265	0	0	0	191	99	92	31.51	0.00
327	Namatikiri	102	559	291	268	196	103	93	0	0	0	60	26	34	35.06	0.00
328	Balia Pasi	58	299	148	151	7	4	3	18	8	10	26	16	10	2.34	6.02
329	Brahman Bad	39	211	108	103	61	30	31	0	0	0	26	10	16	28.91	0.00
330	Khaman	759	3946	2039	1907	702	358	344	77	42	35	421	232	189	17.79	1.95
331	Pahanga	550	2593	1315	1278	560	283	277	51	20	31	276	153	123	21.60	1.97
332	Nahanda	97	475	251	224	297	150	147	0	0	0	69	32	37	62.53	0.00
333	Matabad	255	1316	666	650	132	80	52	8	4	4	161	80	81	10.03	0.61
334	Sendhapur	104	487	249	238	100	52	48	361	180	181	67	32	35	20.53	74.13
335	Chhatra Kana	116	555	273	282	335	159	176	11	7	4	94	50	44	60.36	1.98
336	Krushnnagar	137	658	336	322	62	26	36	0	0	0	60	29	31	9.42	0.00
337	Kaitha	347	1937	1000	937	844	430	414	0	0	0	241	140	101	43.57	0.00
338	Krushnanagar Patna	77	383	199	184	56	32	24	0	0	0	35	21	14	14.62	0.00
339	Gobinda Pur	34	170	86	84	0	0	0	0	0	0	20	13	7	0.00	0.00
340	Laxmi Nagar	526	2587	1312	1275	199	98	101	37	18	19	289	155	134	7.69	1.43
341	Gotutha	2	12	5	7	0	0	0	0	0	0	2	0	2	0.00	0.00
342	Tara Pur	183	900	458	442	433	219	214	66	36	30	113	57	56	48.11	7.33
343	Sala Pada	116	553	280	273	44	20	24	0	0	0	79	38	41	7.96	0.00
344	Balarampur	11	54	29	25	17	10	7	27	14	13	12	8	4	31.48	50.00
345	Naudapur	163	830	433	397	124	69	55	0	0	0	93	51	42	14.94	0.00
346	Brahmangan	39	184	91	93	0	0	0	0	0	0	18	10	8	0.00	0.00
347	Khajuri Pur	31	160	84	76	132	70	62	0	0	0	15	5	10	82.50	0.00
348	Jokadia	186	793	414	379	130	66	64	0	0	0	93	51	42	16.39	0.00
349	Khapuria Pada	274	1339	690	649	530	268	262	0	0	0	147	86	61	39.58	0.00
350	Rampur Sagadi	113	619	314	305	0	0	0	0	0	0	61	32	29	0.00	0.00
351	Serapur	71	357	178	179	0	0	0	0	0	0	40	22	18	0.00	0.00
352	Nuapatna	61	282	142	140	86	45	41	0	0	0	34	23	11	30.50	0.00
353	Jalaka	202	766	392	374	0	0	0	0	0	0	102	51	51	0.00	0.00
354	Khandara Pur	46	217	116	101	47	27	20	0	0	0	21	14	7	21.66	0.00
355	Goleipur	299	1420	732	688	325	166	159	0	0	0	163	86	77	22.89	0.00

356	Badabiruan	522	2485	1250	1235	886	436	450	4	2	2	265	134	131	35.65	0.16
357	Godipatana	173	778	391	387	99	47	52	0	0	0	75	42	33	12.72	0.00
358	Benga madha Pur	64	322	161	161	87	40	47	0	0	0	36	18	18	27.02	0.00
359	Salapari	19	87	42	45	49	23	26	13	3	10	10	4	6	56.32	14.94
360	Rautra Pur	283	1395	710	685	237	121	116	198	94	104	157	77	80	16.99	14.19
361	Telia	60	353	174	179	2	1	1	0	0	0	37	21	16	0.57	0.00
362	Sana Biruan	185	833	432	401	467	248	219	0	0	0	83	38	45	56.06	0.00
363	Mangaraj Pur	113	449	237	212	18	12	6	0	0	0	44	23	21	4.01	0.00
364	Banamali Pur	122	613	301	312	415	198	217	0	0	0	77	35	42	67.70	0.00
365	Banja	209	948	495	453	191	99	92	0	0	0	95	52	43	20.15	0.00
366	Chhatra Kana	116	555	273	282	335	159	176	11	7	4	94	50	44	60.36	1.98
367	Kumudisasan	43	199	103	96	34	15	19	0	0	0	28	10	18	17.09	0.00
368	Talagarh	442	2106	1103	1003	603	316	287	0	0	0	231	129	102	28.63	0.00
369	Hatapur	57	321	155	166	185	93	92	0	0	0	45	20	25	57.63	0.00
370	radha nagar	20	84	46	38	0	0	0	83	45	38	16	10	6	0.00	98.81
371	Solapur	325	1399	711	688	40	20	20	514	251	263	189	105	84	2.86	36.74
372	Charada	116	456	233	223	184	94	90	0	0	0	59	30	29	40.35	0.00
373	Dhantri	187	857	432	425	100	48	52	0	0	0	88	43	45	11.67	0.00

In KEONJHAR District

Sl. No.	Village Name	No.of House holds	Population												Percentag	
			Total	Male	Female	SC			ST			0-6 Years				
						Total	Male	Female	Total	Male	Female	Total	Male	Female	SC	ST
1	Indupura	113	530	266	264	196	101	95	46	21	25	83	43	40	36.98	8.68
2	Jenapada	123	474	227	247	69	33	36	6	2	4	47	15	32	14.56	1.27
3	Nandabar	279	1250	618	632	757	369	388	243	124	119	169	76	93	60.56	19.44
4	Baranga	307	1491	745	746	235	115	120	1024	502	522	263	129	134	15.76	68.68
5	Beguniadihi	114	542	277	265	199	101	98	0	0	0	46	25	21	36.72	0.00
6	Tukuna	351	1426	725	701	589	291	298	180	86	94	177	87	90	41.30	12.62
7	Banika	174	879	456	423	878	456	422	0	0	0	128	72	56	99.89	0.00
8	Hatibandha	168	820	420	400	0	0	0	0	0	0	78	37	41	0.00	0.00
9	Madanpur	559	2536	1298	1238	1039	527	512	263	123	140	296	148	148	40.97	10.37
10	Hasanpur	114	558	297	261	18	9	9	0	0	0	59	30	29	3.23	0.00
11	Nayagarh	288	1269	632	637	115	59	56	1116	552	564	236	125	111	9.06	87.94
12	Rudranarayanpur	118	580	286	294	0	0	0	240	120	120	86	42	44	0.00	41.38
13	Machhalo	489	2000	990	101	447	219	228	69	33	36	237	127	110	22.35	3.45
14	Pandua	130	615	287	328	45	24	21	563	258	305	98	45	53	7.32	91.54
15	Karadapal	323	1568	757	811	26	11	15	1170	562	608	252	122	130	1.66	74.62
16	Bato	400	1744	871	873	765	379	386	36	20	16	219	96	123	43.86	2.06
17	Tampo	53	229	113	116	50	26	24	0	0	0	22	10	12	21.83	0.00
18	Sainkul P.S	17761	78693	3981	3887	16124	806	8060	9519	4720	4799	9406	4838	4568	20.49	12.10
19	Kolhabarapada	387	1729	874	855	102	44	58	1310	656	654	388	205	183	5.90	75.77
20	Paramanandapur	22	97	41	56	96	40	56	0	0	0	9	3	6	98.97	0.00
21	Khalana	725	3158	1623	1535	206	106	100	29	15	14	335	189	146	6.52	0.92
22	Dantia	197	1026	464	562	468	221	247	120	20	100	137	58	79	45.61	11.70
23	Lunahar	128	607	294	313	55	28	27	22	10	12	72	39	33	9.06	3.62

24	Patasura	137	585	300	285	241	124	117	0	0	0	69	35	34	41.20	0.00
25	Taruan	317	1383	693	690	425	199	226	46	22	24	163	85	78	30.73	3.33
26	Brahmanapanga	143	601	296	305	38	18	20	460	228	232	96	53	43	6.32	76.54
27	Kendukhunta	124	626	330	296	198	103	95	0	0	0	82	39	43	31.63	0.00
28	Ramachandrapur	181	919	468	451	7	5	2	580	288	292	161	86	75	0.76	63.11
29	Baranga	212	1003	500	503	398	191	207	24	8	16	112	53	59	39.68	2.39
30	Angarua	364	1613	839	774	549	282	267	0	0	0	170	89	81	34.04	0.00
31	Mathianendi	81	351	173	178	0	0	0	139	66	73	26	12	14	0.00	39.60
32	Tigiria	77	342	170	172	5	3	2	330	164	166	101	55	46	1.46	96.49
33	Alati	517	2300	1206	1094	376	191	185	125	69	56	224	113	111	16.35	5.43
34	Raitola	179	874	435	439	80	48	32	4	2	2	76	40	36	9.15	0.46
35	Krushnapur	104	460	228	232	75	40	35	108	54	54	55	34	21	16.30	23.48
36	Ghasipura P.S	25280	11274	5682	5591	20559	102	1028	3292	1614	1678	14492	7405	7087	18.24	29.21
37	Purunian	259	1319	680	639	255	127	128	18	10	8	147	75	72	19.33	1.36
38	Naduan	275	11851	596	589	86	43	43	0	0	0	104	52	86	0.73	0.00
39	Balarampur	412	1580	842	738	420	212	208	12	5	7	153	87	66	26.58	0.76
40	Belabhali	912	4402	2292	2110	247	119	128	407	192	215	487	259	228	5.61	9.25
41	Mangalpur	193	872	451	421	0	0	0	491	250	241	148	75	73	0.00	56.31
42	Paikchatra	172	683	358	325	0	0	0	0	0	0	70	45	25	0.00	0.00
43	Jalasuan	229	874	439	435	12	5	7	42	17	25	76	35	41	1.37	4.81
44	Suanpada	193	748	375	373	307	156	151	67	29	38	101	51	50	41.04	8.96
45	Dhinkia	124	593	295	298	28	13	15	22	10	12	58	26	32	4.72	3.71
46	Kodapada	464	2158	1117	1041	235	119	116	122	57	65	224	117	107	10.89	5.65
47	Gobindapur	211	1112	582	530	4	3	1	873	465	408	221	123	98	0.36	78.51
48	Gohirabani	131	577	287	290	0	0	0	518	259	259	84	48	36	0.00	89.77
49	Talagaon	409	1694	844	850	310	154	156	930	464	466	214	98	116	18.30	54.90
50	Sadangi	310	1327	684	643	19	11	8	517	259	258	207	120	87	1.43	38.96
51	Gohira	404	1890	945	945	18	10	8	1702	845	857	253	140	113	0.95	90.05
52	Anandpur (M)	8601	39585	2046	1912	7367	377	3596	4056	2077	1979	4376	2294	2082	18.61	10.25
53	Palaspur	13	62	31	31	46	21	25	13	8	5	6	3	3	74.19	20.97
54	Kumunia	159	784	397	387	7	4	3	755	380	375	117	65	52	0.89	96.30
55	Indupura	113	530	266	264	196	101	95	46	21	25	83	43	40	36.98	8.68

56	Kainpura	216	1016	497	519	65	29	36	152	75	77	120	60	60	6.40	14.96
57	Jhadakhundi	166	762	377	385	181	86	95	227	106	121	78	37	41	23.75	29.79
58	Chamuhin	83	385	194	191	385	194	191	0	0	0	49	26	23	100.0	0.00
59	Vatisira	133	543	279	264	127	63	64	0	0	0	54	28	26	23.39	0.00
60	Bancho	763	3570	1794	1776	880	442	438	103	54	49	351	168	183	24.65	2.89
61	Bailo	273	1403	704	699	809	402	407	5	3	2	177	90	87	57.66	0.36
62	Guhalia	195	980	493	487	917	461	456	0	0	0	130	58	72	93.57	0.00
63	Nuapada	201	900	452	448	49	23	26	496	249	247	93	44	49	5.44	55.11
64	Banika	174	879	456	423	878	456	422	0	0	0	128	72	56	99.89	0.00
65	Khadibil	220	1028	521	507	909	455	454	0	0	0	132	72	60	88.42	0.00
66	Barigaon	221	1011	532	479	0	0	0	604	315	289	138	81	57	0.00	59.74
67	Hatibandha	168	820	420	400	0	0	0	0	0	0	78	37	41	0.00	0.00
68	Panchupali	1309	5415	2778	2637	1153	590	563	1585	797	788	616	320	296	21.29	29.27
69	Sibanarayanpur	47	244	111	133	13	5	8	76	37	39	32	11	21	5.33	31.15
70	Atasahipatana	153	625	318	307	0	0	0	0	0	0	60	31	29	0.00	0.00
71	Atasahi	358	1356	681	675	55	30	25	0	0	0	136	72	64	4.06	0.00
72	Sarei	363	1460	725	735	564	280	284	727	356	371	226	121	105	38.63	49.79
73	Hatisila	78	360	195	165	1	1	0	338	183	155	67	37	30	0.28	93.89
74	Kochianendi	181	812	406	406	277	138	139	0	0	0	67	31	36	34.11	0.00
75	Satatira	245	1105	560	545	180	91	89	368	189	179	111	50	61	16.29	33.30
76	Raghabpur	125	568	291	277	129	67	62	0	0	0	68	26	42	22.71	0.00
77	Deogaon	42	181	79	102	0	0	0	155	68	87	17	8	9	0.00	85.64
78	Adghuria	254	916	455	461	71	40	31	4	2	2	105	48	57	7.75	0.44
79	Bhaganai	287	1385	689	696	83	39	44	33	20	13	173	100	73	5.99	2.38
80	Tolankapada	530	2287	1197	1090	537	280	257	0	0	0	273	132	141	23.48	0.00
81	Kanpur	176	724	388	336	52	28	24	1	1	0	78	46	32	7.18	0.14
82	Uchabali	162	802	414	388	1	0	1	635	320	315	110	63	47	0.12	79.18
83	Dipapal	92	394	196	198	0	0	0	38	18	20	46	23	23	0.00	9.64
84	Sanabadabila	161	783	391	392	30	15	15	356	175	181	119	57	62	3.83	45.47
85	Dhinkia	124	593	295	298	28	13	15	22	10	12	58	26	32	4.72	3.71
86	Hirapur	40	153	73	80	0	0	0	17	9	8	18	11	7	0.00	11.11
87	Siapada	130	518	262	256	0	0	0	0	0	0	60	26	34	0.00	0.00

88	Sahanadpur	39	139	68	71	109	55	54	0	0	0	19	10	9	78.42	0.00
89	Mugupur	94	367	174	193	4	1	3	0	0	0	40	18	22	1.09	0.00
90	Haridapal	154	643	327	316	293	142	151	0	0	0	76	32	44	45.57	0.00
91	Tikara	146	537	284	253	155	89	66	1	1	0	59	37	22	28.86	0.19
92	Godipatna	87	402	204	198	91	46	45	0	0	0	44	24	20	22.64	0.00
93	Tarava	183	783	406	377	202	112	90	0	0	0	82	45	37	25.80	0.00
94	Naukana	62	236	114	122	0	0	0	5	4	1	23	9	14	0.00	2.12
95	Bamphidi	317	1244	621	623	190	95	95	474	225	249	157	84	73	15.27	38.10
96	Nayagarh	288	1269	632	637	115	59	56	1116	552	564	236	125	111	9.06	87.94
97	Ambo	279	1191	591	600	463	220	243	1	0	1	121	62	59	38.87	0.08
98	Pahadpur	155	729	368	361	132	65	67	513	259	254	96	50	46	18.11	70.37
99	Panchara	195	943	462	481	224	104	120	179	83	96	98	45	53	23.75	18.98
100	Patilo	180	667	335	332	137	71	66	190	92	98	89	35	54	20.54	28.49
101	Khadikasulabahali	223	1049	541	508	0	0	0	24	13	11	140	68	72	0.00	2.29
102	Kothasahi	58	284	152	132	0	0	0	252	128	124	31	17	14	0.00	88.73
103	Anjira	78	335	171	164	51	26	25	0	0	0	36	19	17	15.22	0.00
104	Fatepur	24	97	49	48	0	0	0	0	0	0	16	9	7	0.00	0.00
105	Agarda	179	827	417	410	387	196	191	0	0	0	104	56	48	46.80	0.00
106	Nuagaon	212	977	510	467	87	46	41	751	383	368	242	114	128	8.90	76.87
107	Madhukesari	379	1414	758	656	297	154	143	0	0	0	141	84	57	21.00	0.00
108	Dihakatina	22	125	64	61	0	0	0	0	0	0	11	5	6	0.00	0.00
109	Garhbandhogoda	447	2325	1188	1137	365	188	177	831	419	412	379	203	176	15.70	35.74
110	Malikatina	57	282	137	145	0	0	0	0	0	0	27	15	12	0.00	0.00
111	Gainthagodi	24	87	41	46	0	0	0	0	0	0	12	3	9	0.00	0.00
112	Atta	365	1707	856	851	221	117	104	0	0	0	200	91	109	12.95	0.00
113	Kainsiari	81	403	208	195	74	32	42	8	3	5	35	25	10	18.36	1.99
114	Ullol	180	898	448	450	115	57	58	0	0	0	132	70	62	12.81	0.00
115	Mangalagadia	43	158	78	80	0	0	0	0	0	0	17	11	6	0.00	0.00
116	Girigaon	209	1002	521	481	434	230	204	0	0	0	112	62	50	43.31	0.00
117	Kantabania	110	472	229	243	368	179	189	0	0	0	54	25	29	77.97	0.00
118	Chandali	96	437	218	219	0	0	0	0	0	0	50	25	25	0.00	0.00
119	Baharipur	221	883	456	427	370	193	177	0	0	0	86	48	38	41.90	0.00

120	Jarak	53	285	146	139	53	29	24	102	52	50	44	26	18	18.60	35.79
121	Sanapadana	75	351	170	181	23	12	11	0	0	0	26	9	17	6.55	0.00
122	Bahugadia	23	103	48	55	0	0	0	8	2	6	16	9	7	0.00	7.77
123	Haripur	72	318	164	154	14	5	9	0	0	0	30	15	15	4.40	0.00
124	Baniapasi	193	836	401	435	322	155	167	0	0	0	97	41	56	38.52	0.00
125	Bramhanda	114	523	262	261	71	37	34	0	0	0	53	28	25	13.58	0.00
126	Suanlo	152	736	378	358	3	2	1	340	166	174	97	55	42	0.41	46.20
127	Valuka	120	454	224	230	205	98	107	36	16	20	51	22	29	45.15	7.93
128	Napanga	97	404	203	201	307	157	150	0	0	0	55	25	30	75.99	0.00
129	Mahuri	127	651	335	316	7	5	2	0	0	0	91	41	50	1.08	0.00
130	Ujuni	106	476	255	221	0	0	0	0	0	0	48	27	21	0.00	0.00
131	Balibaruan	93	335	176	159	139	72	67	0	0	0	30	16	14	41.49	0.00
132	Bhandaripada	25	119	63	56	0	0	0	0	0	0	16	10	6	0.00	0.00
133	Kaithapatna	113	416	193	223	82	36	46	0	0	0	46	23	23	19.71	0.00
134	Padanpur	440	1937	988	949	438	214	224	0	0	0	183	99	84	22.61	0.00
135	Badapadana	505	2357	1184	1173	418	201	217	44	19	25	269	138	131	17.73	1.87
136	Saladei	343	1425	678	747	684	327	357	0	0	0	162	81	81	48.00	0.00
137	Kendukhunta	124	626	330	296	198	103	95	0	0	0	82	39	43	31.63	0.00
138	Samana	364	1568	831	737	533	274	259	0	0	0	199	107	92	33.99	0.00
139	Karadamali	78	270	139	131	0	0	0	0	0	0	32	16	16	0.00	0.00
140	Belasundari	172	760	370	390	109	60	49	62	30	32	91	43	48	14.34	8.16
141	Gudiadihi	102	367	190	177	0	0	0	314	163	151	70	43	27	0.00	85.56
142	Narda	139	617	359	258	193	96	97	131	99	32	73	43	30	31.28	21.23
143	Janardanpurpatna	106	463	246	217	23	13	10	262	136	126	55	34	21	4.97	56.59
144	Aligaon	68	297	148	149	0	0	0	0	0	0	43	19	24	0.00	0.00
145	Odapada	183	664	316	348	59	30	29	0	0	0	55	27	28	8.89	0.00
146	Purunabandhogod	204	762	385	377	103	48	55	0	0	0	66	35	31	13.52	0.00
147	Jarda	132	556	285	271	27	14	13	0	0	0	79	41	38	4.86	0.00
148	Katenikantal	77	357	179	178	9	6	3	206	100	106	49	24	25	2.52	57.70
149	Sainpal	131	717	369	348	27	14	13	0	0	0	82	43	39	3.77	0.00
150	Bilabandha	132	600	295	305	263	132	131	241	119	122	85	41	44	43.83	40.17
151	Guhaldihi	32	154	79	75	153	78	75	0	0	0	24	14	10	99.35	0.00

152	Ganpur	8	60	29	31	0	0	0	55	26	29	10	7	3	0.00	91.67
153	Kolipal	123	605	323	282	603	323	280	0	0	0	63	30	33	99.67	0.00
154	Nuhamalia	178	1134	546	588	135	75	60	995	470	525	214	92	122	11.90	87.74
155	Beladiha	96	463	219	244	0	0	0	419	198	221	72	29	43	0.00	90.50
156	Biragobindapur	535	2254	1140	1114	349	175	174	1117	558	559	319	178	141	15.48	49.56
157	Belada	80	352	186	166	0	0	0	257	138	119	32	19	13	0.00	73.01
158	Baunspal	496	2012	946	1066	99	42	57	948	458	490	233	102	131	4.92	47.12
159	Gobargali	178	860	442	418	22	9	13	511	258	253	140	68	72	2.56	59.42

Employment pattern of the study area (in Dhenkanal District):

Sl. No.	Village Name	Working Population			Main Worker			Marginal Worker			Non Worker			Percentage		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Main Worker	Marginal Worker	Non Worker
1.	Kanaka	122	106	16	9	4	5	113	102	11	280	86	194	2.24	28.11	69.65
2.	Kankarpur	67	46	21	46	45	1	21	1	20	83	37	46	30.67	14.00	55.33
3.	Analakata	267	249	18	9	3	6	258	246	12	563	178	385	1.08	31.08	67.83
4.	Jayapurakateni	1135	638	497	415	390	25	720	248	472	901	396	505	20.38	35.36	44.25
5.	Denga Bahali	203	101	102	91	84	7	112	17	95	232	118	114	20.92	25.75	53.33
6.	Kenduapada	390	189	201	304	158	146	86	31	55	260	120	140	46.77	13.23	40.00
7.	Bhuban P.S	32432	28337	4095	21767	20379	1388	10665	7958	2707	6861	2365	44964	21.54	10.55	67.91
8.	Odisha	1327	1057	270	892	770	122	435	287	148	2694	975	1719	22.18	10.82	67.00
9	Kumurasinga	169	160	9	109	100	9	60	60	0	361	115	246	20.57	11.32	68.11
10.	Kuninda	493	451	42	366	351	15	127	100	27	1133	353	780	22.51	7.81	69.68
11.	Khoksa(L)	97	92	5	89	86	3	8	6	2	199	65	134	30.07	2.70	67.23
12.	Khoksa(R)	110	107	3	109	106	3	1	1	0	223	73	150	32.73	0.30	66.97
13.	Baruan	400	378	22	355	337	18	45	41	4	923	291	632	26.83	3.40	69.77
14.	Kansaragoda	353	290	63	162	147	15	191	143	48	713	265	448	15.20	17.92	66.89
15.	Dhalapada	242	212	30	190	184	6	52	28	24	505	174	331	25.44	6.96	67.60
16.	Kainsiri	376	372	4	277	274	3	99	98	1	874	270	604	22.16	7.92	69.92
17.	Muruga	416	353	63	261	247	14	155	106	49	696	226	470	23.47	13.94	62.59
18.	Balijhati	217	168	49	149	132	17	68	36	32	352	116	236	26.19	11.95	61.86
19.	Anantapur	290	251	39	219	204	15	71	47	24	622	241	381	24.01	7.79	68.20
20.	Garudabandi	331	263	68	288	242	46	43	21	22	600	213	387	30.93	4.62	64.45
21.	Naya Nilakanthapur	141	136	5	140	135	5	1	1	0	307	97	210	31.25	0.22	68.53
22.	Patapur	141	113	28	74	71	3	67	42	25	251	92	159	18.88	17.09	64.03
23.	Jaypur	458	434	24	161	148	13	297	286	11	971	299	672	11.27	20.78	67.95
24.	Kingol	281	199	82	77	72	5	204	127	77	386	160	226	11.54	30.58	57.87
25.	Kirtanpur	440	363	77	123	111	12	317	252	65	800	281	519	9.92	25.56	64.52
26.	Bhusala	689	664	25	621	600	21	68	64	4	1613	543	1070	26.98	2.95	70.07
27.	Praharajpur	34	33	1	16	16	0	18	17	1	68	13	55	15.69	17.65	66.67

28.	Kanapalsamilmahulpal	997	956	41	765	743	22	232	213	19	2603	910	1693	21.25	6.44	72.31
29.	Chandipal	301	288	13	274	267	7	27	21	6	704	222	482	27.26	2.69	70.05
30.	Karadabani	365	321	44	326	293	33	39	28	11	750	234	516	29.24	3.50	67.26
31.	Kanapal	84	61	23	60	58	2	24	3	21	123	53	70	28.99	11.59	59.42
32.	Sitalabasa	207	179	28	148	144	4	59	35	24	329	89	240	27.61	11.01	61.38
33.	Kankana	828	555	273	555	463	92	273	92	181	876	339	537	32.57	16.02	51.41
34.	Anala	489	446	43	402	388	14	87	58	29	998	320	678	27.03	5.85	67.12
35.	Senanda	103	66	37	20	17	3	83	49	34	137	42	95	8.33	34.58	57.08
36.	Brahmankhantakhol	102	76	26	25	22	3	77	54	23	110	38	72	11.79	36.32	51.89
37.	Hariamaru	63	43	20	45	40	5	18	3	15	76	30	46	32.37	12.95	54.68
38.	Kendupada	324	241	83	125	114	11	199	127	72	483	173	310	15.49	24.66	59.85
39.	Mathanuagan	296	245	51	126	118	8	170	127	43	538	188	350	15.11	20.38	64.51
40.	Balipada	10	7	3	10	7	3	0	0	0	12	2	10	45.45	0.00	54.55
41.	Renadapatana	331	285	46	134	123	11	197	162	35	575	188	387	14.79	21.74	63.47
42.	Palasapithia	359	251	108	107	92	15	252	159	93	921	395	526	8.36	19.69	71.95
43.	Gabagoda	83	50	33	33	29	4	50	21	29	82	40	42	20.00	30.30	49.70
44.	Solagadia	679	480	199	364	336	28	315	144	171	984	392	592	21.89	18.94	59.17
45.	Ichhapur	11	6	5	6	6	0	5	0	5	12	3	9	26.09	21.74	52.17
46	Basudeipur	170	154	16	102	97	5	68	57	11	402	137	265	17.83	11.89	70.28
47.	Dayanabili	388	256	132	283	233	50	105	23	82	431	149	282	34.55	12.82	52.63
48.	Gamargola	23	20	3	18	17	1	5	3	2	58	17	41	22.22	6.17	71.60
49.	Garhnrusingha Prasad	605	494	111	189	174	15	416	320	96	1148	431	717	10.78	23.73	65.49
50.	Anlajhari	506	441	65	354	339	15	152	102	50	1032	357	675	23.02	9.88	67.10
51.	Kankhai	413	267	146	193	190	3	220	77	143	307	101	206	26.81	30.56	42.64
52.	Kesharpur	148	132	16	74	67	7	74	65	9	352	132	220	14.80	14.80	70.40
53.	Balibo(L)	738	711	27	492	471	21	246	240	6	1835	622	1213	19.12	9.56	71.32
54.	Samal	153	140	13	101	94	7	52	46	6	388	115	273	18.67	9.61	71.72
55.	Tipilei	493	386	107	190	187	3	303	199	104	669	217	452	16.35	26.08	57.57
56.	Chhatakhamb	10	6	4	6	6	0	4	0	4	2	1	1	50.00	33.33	16.67
57.	Kumarda	160	92	68	81	77	4	79	15	64	77	26	51	34.18	33.33	32.49

58.	Dadhisinga	59	30	29	23	22	1	36	8	28	41	18	23	23.00	36.00	41.00
60.	Naraharipur	81	73	8	80	72	8	1	1	0	156	46	110	33.76	0.42	65.82
61.	Surapratappur	1762	1633	129	1480	1414	66	282	219	63	4014	1379	2635	25.62	4.88	69.49
62.	Kunda	343	326	17	278	271	7	65	55	10	887	314	573	22.60	5.28	72.11
63.	Sundhikateni	346	272	74	289	245	44	57	27	30	677	249	428	28.25	5.57	66.18
64.	Kanchanbahali	92	76	16	76	70	6	16	6	10	219	79	140	24.44	5.14	70.42
65.	Asurabandha	409	329	80	155	139	16	254	190	64	764	265	499	13.21	21.65	65.13
66.	Arilo	24	20	4	12	12	0	12	8	4	54	24	30	15.38	15.38	69.23
67.	Gadganpur	314	288	26	265	252	13	49	36	13	808	280	528	23.62	4.37	72.01
68.	Chandar	254	238	16	163	152	11	91	86	5	687	216	471	17.32	9.67	73.01
69.	Gopalpur	225	222	3	225	222	3	0	0	0	515	185	330	30.41	0.00	69.59
70.	Gobindabidyadharpur	27	25	2	6	6	0	21	19	2	65	23	42	6.52	22.83	70.65
71.	Malapura	670	496	174	600	478	122	70	18	52	1137	407	730	33.20	3.87	62.92
72.	Nimeinpur	255	243	12	161	154	7	94	89	5	732	228	504	16.31	9.52	74.16
73.	Rodanga	58	31	27	38	29	9	20	2	18	67	39	28	30.40	16.00	53.60
74.	Asurabandha Patana	294	280	14	231	228	3	63	52	11	632	192	440	24.95	6.80	68.25
75.	Mrudanga	822	779	43	647	627	20	175	152	23	1894	651	1243	23.82	6.44	69.73
76.	Bentashalia	120	109	11	68	66	2	52	43	9	248	81	167	18.48	14.13	67.39
77.	Ekatali(Kha)	535	517	18	306	295	11	229	222	7	1474	478	996	15.23	11.40	73.37
78.	Ekatali(Ka)	27	26	1	27	26	1	0	0	0	74	31	43	26.73	0.00	73.27
79.	Brahmapur	35	33	2	21	20	1	14	13	1	76	29	47	18.92	12.61	68.47
80.	Majhipal	230	122	108	54	47	7	176	75	101	266	128	138	10.89	35.48	53.63
81.	Nilakanthapur	355	310	45	340	306	34	15	4	11	668	237	431	33.24	1.47	65.30
82.	Sarangapur	32	31	1	18	18	0	14	13	1	65	17	48	18.56	14.43	67.01
83.	Hatibari	202	155	47	129	124	5	73	31	42	299	97	202	25.75	14.57	59.68
84.	Purastampur	386	357	29	177	168	9	209	189	20	830	253	577	14.56	17.19	68.26
85.	Koriapal	488	298	190	226	209	17	262	89	173	599	208	391	20.79	24.10	55.11
86.	Darjani	260	219	41	88	84	4	172	135	37	542	214	328	10.97	21.45	67.58
87.	Maluagoda	216	118	98	22	19	3	194	99	95	276	110	166	4.47	39.43	56.10
88.	Joragadia	42	29	13	11	11	0	31	18	13	43	18	25	12.94	36.47	50.59
89.	Kankadahad	887	629	258	451	379	72	436	250	186	1227	461	766	21.34	20.62	58.04

In JAJPUR District

Sl. No.	Village Name	Working Population			Main Worker			Marginal Worker			Non Worker			Percentage		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Main Worker	Marginal Worker	Non Worker
1	Ichhapur	155	150	5	143	138	5	12	12	0	475	179	296	22.70	1.90	75.40
2	Jalanda	280	200	80	223	167	56	57	33	24	393	161	232	33.14	8.47	58.4
3	Tarakote	814	777	37	785	760	25	29	17	12	2061	664	1397	27.3	1.01	71.69
4	Barada	388	332	56	373	324	49	15	8	7	800	305	495	31.4	1.26	67.34
5	Tentulikhunta	164	158	6	139	138	1	25	20	5	399	134	265	24.69	4.44	70.87
6	Kayan	833	769	64	608	566	42	225	203	22	2751	953	1798	16.96	6.28	76.76
7	Tulati	288	263	25	206	191	15	82	72	10	817	304	513	18.64	7.42	73.94
8	Pimpal	285	158	127	129	124	5	156	34	122	197	72	125	26.76	32.37	40.87
9	Jaintala	88	84	4	79	77	2	9	7	2	205	62	143	26.96	3.07	69.97
10	Toranda	135	130	5	100	97	3	35	33	2	314	104	210	22.27	7.80	69.93
11	Solabandi	358	339	19	353	336	17	5	3	2	750	228	522	31.86	0.45	67.69
12	Chingudipur	51	50	1	51	50	1	0	0	0	127	50	77	28.65	0.00	71.35
13	Haladigadia	468	446	22	375	366	9	93	80	13	1158	376	782	23.06	5.72	71.22
14	Kogan	191	143	48	185	138	47	6	5	1	268	93	175	40.31	1.31	58.39
15	Talagadia	133	126	7	121	118	3	12	8	4	318	121	197	26.83	2.66	70.51
16	Asanjhar	278	246	32	120	107	13	158	139	19	762	280	482	11.54	15.19	73.27
17	Ranapur	277	272	5	261	256	5	16	16	0	1010	374	636	20.28	1.24	78.48
18	Gajendrapur	228	216	12	227	215	12	1	1	0	529	189	340	29.99	0.13	69.88
19	Jugala	221	213	8	168	164	4	53	49	4	496	160	336	23.43	7.39	69.18
20	Mathurapur	228	213	15	27	18	9	201	195	6	593	205	388	3.29	24.48	72.23
21	Nisankhapur	64	61	3	62	59	3	2	2	0	160	50	110	27.68	0.89	71.43
22	Salaba	325	167	158	213	167	46	112	0	112	247	130	117	37.24	19.58	43.18
23	Barundai	994	899	95	843	780	63	151	119	32	2256	741	1515	25.94	4.65	69.42
24	Bangarakota	462	441	21	292	280	12	170	161	9	1281	489	792	16.75	9.75	73.49
25	Khiro	260	250	10	125	121	4	135	129	6	636	221	415	13.95	15.07	70.98
26	Banhara	158	87	71	154	85	69	4	2	2	119	46	73	55.60	1.44	42.96
27	Amrutia	674	626	48	649	615	34	25	11	14	1576	481	1095	28.84	1.11	70.04
28	Mulapal	133	115	18	87	76	11	46	39	7	664	304	360	10.92	5.77	83.31

29	Kantigadia	348	334	14	237	230	7	111	104	7	877	292	585	19.35	9.06	71.59
30	Sathipur	537	509	28	534	507	27	3	2	1	1228	399	829	30.25	0.17	69.58
31	Balipasi	147	132	15	130	120	10	17	12	5	328	116	212	27.37	3.58	69.05
32	Manipur	156	142	14	151	140	11	5	2	3	343	118	225	30.26	1.00	68.74
33	Panikoili p.s	2148	1881	2663	1693	1549	1436	4549	3322	1227	4390	1472	29184	25.90	6.96	67.15
34	Harichandpur	53	52	1	52	51	1	1	1	0	98	29	69	34.44	0.66	64.90
35	Mirjapur	577	504	73	275	247	28	302	257	45	1512	526	986	13.16	14.46	72.38
36	Ambatola	78	78	0	78	78	0	0	0	0	240	86	154	24.53	0.00	75.47
37	Solapatta	297	284	13	238	230	8	59	54	5	663	206	457	24.79	6.15	69.06
38	Radhanagar	15	15	0	14	14	0	1	1	0	31	9	22	30.43	2.17	67.39
39	Thakurpatana	443	416	27	420	399	21	23	17	6	904	279	625	31.18	1.71	67.11
40	Santarapur	510	302	208	175	138	37	335	164	171	674	290	384	14.78	28.29	56.93
41	Talugan	204	192	12	33	31	2	171	161	10	432	134	298	5.19	26.89	67.92
42	Dhaneswar	294	273	21	280	266	14	14	7	7	1087	427	660	20.28	1.01	78.71
43	Balia pasi	106	97	9	62	58	4	44	39	5	193	51	142	20.74	14.72	64.55
44	Chakua	146	142	4	87	83	4	59	59	0	376	133	243	16.67	11.30	72.03
45	Marutikar	501	489	12	463	458	5	38	31	7	1503	539	964	23.10	1.90	75.00
46	Damodarpur	12	9	3	5	4	1	7	5	2	30	10	20	11.90	16.67	71.43
47	Kumbhirigadi	499	477	22	370	361	9	129	116	13	1165	392	773	22.24	7.75	70.01
48	Jakhapura p.s	4935	4484	451	3872	3601	271	1063	883	180	1248	4315	8174	22.22	6.10	71.68
49	Boulanga	307	289	18	198	185	13	109	104	5	831	270	561	17.40	9.58	73.02
50	Mangalpur	655	548	107	586	510	76	69	38	31	1485	532	953	27.38	3.22	69.39
51	Telibedha	82	75	7	77	73	4	5	2	3	189	69	120	28.41	1.85	69.74
52	Nuagan	148	130	18	133	125	8	15	5	10	333	118	215	27.65	3.12	69.23
53	Ollala	294	280	14	280	274	6	14	6	8	779	273	506	26.10	1.30	72.60
54	Mulasar	335	317	18	216	206	10	119	111	8	658	198	460	21.75	11.98	66.26
55	Dankari	298	278	20	272	257	15	26	21	5	651	187	464	28.66	2.74	68.60
56	Kusunpur	149	129	20	37	32	5	112	97	15	259	87	172	9.07	27.45	63.48
57	Tikarapada	434	401	33	303	283	20	131	118	13	1105	375	730	19.69	8.51	71.80
58	Nandakishorepur	189	169	20	118	106	12	71	63	8	359	110	249	21.53	12.96	65.51
59	Ranipada	224	209	15	168	157	11	56	52	4	537	194	343	22.08	7.36	70.57

60	Dhuligarh	771	673	98	586	541	45	185	132	53	1771	596	1175	23.05	7.28	69.67
61	Dhabahali	138	82	56	81	73	8	57	9	48	177	81	96	25.71	18.10	56.19
62	Jhatiasahi	39	39	0	31	31	0	8	8	0	93	29	64	23.48	6.06	70.45
63	Jajpur sadar p.s	38694	35146	3548	28163	26344	1819	10531	8802	1729	89084	30056	59028	22.04	8.24	69.72
64	Janara	130	108	22	129	107	22	1	1	0	269	92	177	32.33	0.25	67.42
65	Jhumpan	110	103	7	104	100	4	6	3	3	271	95	176	27.30	1.57	71.13
66	Upulei	252	248	4	198	194	4	54	54	0	520	150	370	25.65	6.99	67.36
67	Sadakpur	488	468	20	482	463	19	6	5	1	1310	441	869	26.81	0.33	72.86
68	Korai p.s	3071	2691	3807	2320	2166	1538	7511	5242	2269	6615	2229	43859	23.95	7.75	68.29
69	Santarapur	510	302	208	175	138	37	335	164	171	674	290	384	14.78	28.29	56.93
70	Panasua	29	29	0	7	7	0	22	22	0	126	47	79	4.52	14.19	81.29
71	Khamigan	323	306	17	263	257	6	60	49	11	669	193	476	26.51	6.05	67.44
72	Pataranga	920	581	339	459	423	36	461	158	303	790	283	507	26.84	26.96	46.20
73	Dhanapur	267	260	7	266	259	7	1	1	0	631	191	440	29.62	0.11	70.27
74	Korabandi	583	497	86	529	475	54	54	22	32	1107	364	743	31.30	3.20	65.50
75	Ragada	907	594	313	522	492	30	385	102	283	1273	523	750	23.94	17.66	58.39
76	Kantore	358	345	13	299	287	12	59	58	1	874	294	580	24.27	4.79	70.94
77	Mantira	238	208	30	220	207	13	18	1	17	446	142	304	32.16	2.63	65.20
78	Bhatasolapat	200	191	9	74	68	6	126	123	3	455	147	308	11.30	19.24	69.47
79	Janara	130	108	22	129	107	22	1	1	0	269	92	177	32.33	0.25	67.42
80	Mangobindap	652	617	35	489	471	18	163	146	17	1633	586	1047	21.40	7.13	71.47
81	Kacheri gan	215	159	56	175	136	39	40	23	17	491	189	302	24.79	5.67	69.55
82	Uparagarh	88	88	0	79	79	0	9	9	0	236	80	156	24.38	2.78	72.84
83	Kantia	469	435	34	406	384	22	63	51	12	1551	530	1021	20.10	3.12	76.78
84	Barakhai	269	248	21	253	238	15	16	10	6	690	248	442	26.38	1.67	71.95
85	Nadia bhanga	665	586	79	618	557	61	47	29	18	1615	613	1002	27.11	2.06	70.83
86	Khandia	144	130	14	140	127	13	4	3	1	361	110	251	27.72	0.79	71.49
87	Madhapur	229	162	67	29	29	0	200	133	67	198	76	122	6.79	46.84	46.37
88	Sarangapur	600	483	117	513	425	88	87	58	29	1145	416	729	29.40	4.99	65.62
89	Champa	103	98	5	51	48	3	52	50	2	287	92	195	13.08	13.33	73.59
90	Khurunti	811	607	204	280	207	73	531	400	131	1166	394	772	14.16	26.86	58.98

91	Gobara ghati	1724	1084	640	760	566	194	964	518	446	3240	1469	1771	15.31	19.42	65.27
92	Chandia	442	261	181	311	237	74	131	24	107	857	364	493	23.94	10.08	65.97
93	Ankura pal	224	181	43	204	169	35	20	12	8	727	271	456	21.45	2.10	76.45
94	Ramachandrap	200	169	31	138	129	9	62	40	22	413	145	268	22.51	10.11	67.37
95	Nilamanidei pursasan	225	218	7	36	34	2	189	184	5	497	154	343	4.99	26.18	68.84
96	Digambarpur	121	112	9	38	30	8	83	82	1	292	102	190	9.20	20.10	70.70
97	Sana pingal	116	107	9	114	105	9	2	2	0	256	88	168	30.65	0.54	68.82
98	Bada pingal	559	544	15	548	534	14	11	10	1	1378	473	905	28.29	0.57	71.14
99	Nimapali	815	640	175	637	576	61	178	64	114	1580	594	986	26.60	7.43	65.97
100	Golagan	369	332	37	275	259	16	94	73	21	1069	412	657	19.12	6.54	74.34
101	Baghuapal	268	178	90	105	78	27	163	100	63	732	251	481	10.5	16.3	73.20
102	Bharada pasi	137	94	43	86	68	18	51	26	25	246	92	154	22.45	13.32	64.23
103	Kantira	551	440	111	416	388	28	135	52	83	897	310	587	28.73	9.32	61.95
104	Atta	897	862	35	653	624	29	244	238	6	2349	791	1558	20.12	7.52	72.37
105	Bartanda	721	688	33	547	523	24	174	165	9	1710	600	1110	22.50	7.16	70.34
106	Bahabalpur	210	194	16	205	192	13	5	2	3	579	200	379	25.98	0.63	73.38
107	Haripur	1024	975	49	830	796	34	194	179	15	2647	952	1695	22.61	5.28	72.11
108	Gahira patuli	122	117	5	100	96	4	22	21	1	266	80	186	25.77	5.67	68.56
109	Hatibari	1131	1063	68	845	797	48	286	266	20	2933	964	1969	20.79	7.04	72.17
110	Karadapal	136	132	4	55	51	4	81	81	0	398	149	249	10.30	15.17	74.53
111	Bairimal	544	518	26	515	491	24	29	27	2	1409	495	914	26.37	1.48	72.15
112	Bhalukipatala	459	277	182	259	225	34	200	52	148	714	342	372	22.08	17.05	60.87
113	Garamian	995	523	472	341	307	34	654	216	438	878	439	439	18.21	34.92	46.88
114	Kankadapal	370	279	91	208	202	6	162	77	85	672	244	428	19.96	15.55	64.49
115	Bambilo	593	544	49	509	491	18	84	53	31	1524	558	966	24.04	3.97	71.99
116	Botalanda	662	625	37	544	521	23	118	104	14	1669	566	1103	23.34	5.06	71.60
117	Kuhika	641	374	267	341	312	29	300	62	238	709	323	386	25.26	22.22	52.52
118	Gandhapal	394	298	96	124	109	15	270	189	81	813	327	486	10.27	22.37	67.36
119	Mulakhamba	186	118	68	117	106	11	69	12	57	259	105	154	26.29	15.51	58.20
120	Nuadihi	212	185	27	179	171	8	33	14	19	459	143	316	26.68	4.92	68.41
121	Manatira	664	619	45	492	458	34	172	161	11	2009	699	1310	18.41	6.43	75.16

122	Barabati	369	314	55	361	308	53	8	6	2	867	296	571	29.21	0.65	70.15
123	Mangalpur	655	548	107	586	510	76	69	38	31	1485	532	953	27.38	3.22	69.39
124	Uchabali	399	378	21	352	335	17	47	43	4	1036	336	700	24.53	3.28	72.20
125	Badabil	138	137	1	107	107	0	31	30	1	341	115	226	22.34	6.47	71.19
126	Kumbhanagar	93	89	4	83	81	2	10	8	2	242	79	163	24.78	2.99	72.24
127	Gouda bahali	130	120	10	121	112	9	9	8	1	274	89	185	29.95	2.23	67.82
128	Ragadi	384	331	53	281	265	16	103	66	37	920	371	549	21.55	7.90	70.55
129	Tura	85	80	5	64	62	2	21	18	3	181	49	132	24.06	7.89	68.05
130	Tarailo	338	320	18	306	298	8	32	22	10	749	230	519	28.15	2.94	68.91
131	Nachhipura	533	514	19	294	284	10	239	230	9	1362	467	895	15.51	12.61	71.87
132	Kharadabandi	200	198	2	63	62	1	137	136	1	504	159	345	8.95	19.46	71.59
133	Chitri	1300	1041	259	977	933	44	323	108	215	2459	861	1598	25.99	8.59	65.42
134	Salijanga	904	776	128	776	725	51	128	51	77	2158	785	1373	25.34	4.18	70.48
135	Godarapal	94	91	3	50	48	2	44	43	1	255	77	178	14.33	12.61	73.07
136	Routpada	271	268	3	244	243	1	27	25	2	711	221	490	24.85	2.75	72.40
137	Andhari	633	369	264	272	251	21	361	118	243	359	131	228	27.42	36.39	36.19
138	Kadama	801	678	123	410	391	19	391	287	104	1410	424	986	18.54	17.68	63.77
139	Kiapada	430	387	43	353	322	31	77	65	12	1010	340	670	24.51	5.35	70.14
140	Gopalpur	106	105	1	95	94	1	11	11	0	338	130	208	21.40	2.48	76.13
141	Raghupur	102	102	0	92	92	0	10	10	0	273	96	177	24.53	2.67	72.80
142	Ramakrishnapur	182	174	8	161	156	5	21	18	3	465	152	313	24.88	3.25	71.87
143	Belada	53	49	4	53	49	4	0	0	0	212	86	126	20.00	0.00	80.00
144	Mahulia	162	149	13	93	84	9	69	65	4	405	138	267	16.40	12.17	71.43
145	Paramanandapur	353	334	19	301	293	8	52	41	11	893	306	587	24.16	4.17	71.67
146	Aranto	3	2	1	2	1	1	1	1	0	7	4	3	20.00	10.00	70.00
147	Patarakana	146	141	5	59	56	3	87	85	2	406	127	279	10.69	15.76	73.55
148	Sampur	31	30	1	23	22	1	8	8	0	66	25	41	23.71	8.25	68.04
149	Sanla	262	248	14	222	215	7	40	33	7	644	198	446	24.50	4.42	71.08
150	Kacharasahi	398	379	19	372	356	16	26	23	3	974	318	656	27.11	1.90	70.99
151	Bachhipur	134	131	3	132	129	3	2	2	0	354	117	237	27.05	0.41	72.54
152	Sitalgobindpu	107	95	12	107	95	12	0	0	0	268	89	179	28.53	0.00	71.47

153	Pachhikote	343	325	18	295	286	9	48	39	9	814	256	558	25.50	4.15	70.35
154	Sunachara	44	44	0	44	44	0	0	0	0	111	37	74	28.39	0.00	71.61
155	Nayahatpatna	135	128	7	133	128	5	2	0	2	298	94	204	30.72	0.46	68.82
156	Mukundapur	969	884	85	796	767	29	173	117	56	2005	628	1377	26.77	5.82	67.42
157	Ranagundi	523	402	121	408	393	15	115	9	106	1041	409	632	26.09	7.35	66.56
158	Tulasipur	280	256	24	275	254	21	5	2	3	654	197	457	29.44	0.54	70.02
159	Gourpur	187	163	24	162	151	11	25	12	13	427	147	280	26.38	4.07	69.54
160	Baliapal	1134	599	535	548	413	135	586	186	400	1159	540	619	23.90	25.56	50.55
161	Sulia	308	281	27	202	187	15	106	94	12	925	320	605	16.38	8.60	75.02
162	Sahaspur	56	56	0	56	56	0	0	0	0	145	40	105	27.86	0.00	72.14
163	Purbakote	305	291	14	303	289	14	2	2	0	754	254	500	28.61	0.19	71.20
164	Khosalpur	81	77	4	59	56	3	22	21	1	181	48	133	22.52	8.40	69.08
165	Narendrabho	57	55	2	24	23	1	33	32	1	162	59	103	10.96	15.07	73.97
166	Manjuri	60	57	3	60	57	3	0	0	0	123	30	93	32.79	0.00	67.21
167	Talia	49	48	1	33	33	0	16	15	1	101	32	69	22.00	10.67	67.33
168	Gohiragadia	345	328	17	344	328	16	1	0	1	835	267	568	29.15	0.08	70.76
169	Asanagadia	311	156	155	147	129	18	164	27	137	195	87	108	29.05	32.41	38.54
170	Gayalgadia	49	43	6	35	35	0	14	8	6	87	31	56	25.74	10.29	63.97
171	Biridiha	85	82	3	80	79	1	5	3	2	304	113	191	20.57	1.29	78.15
172	Barahampur	142	129	13	54	51	3	88	78	10	325	94	231	11.56	18.84	69.59
173	Solapatia	138	126	12	121	110	11	17	16	1	273	75	198	29.44	4.14	66.42
174	Gamharia	204	193	11	203	192	11	1	1	0	529	165	364	27.69	0.14	72.17
175	Oshala	257	250	7	192	187	5	65	63	2	808	287	521	18.03	6.10	75.87
176	Rampilo	354	336	18	267	253	14	87	83	4	843	277	566	22.31	7.27	70.43
177	Godigotha	326	299	27	293	269	24	33	30	3	819	264	555	25.59	2.88	71.53
178	Bainsipur	58	56	2	32	31	1	26	25	1	105	27	78	19.63	15.95	64.42
179	Jaintira	55	53	2	37	35	2	18	18	0	104	29	75	23.27	11.32	65.41
180	Aranyamadan	221	160	61	103	99	4	118	61	57	239	80	159	22.39	25.65	51.96
181	Mandapada	103	56	47	102	55	47	1	1	0	120	45	75	45.74	0.45	53.81
182	Jalapatipur	37	33	4	33	31	2	4	2	2	104	36	68	23.40	2.84	73.76
183	Pimpudia	1155	704	451	812	607	205	343	97	246	1306	568	738	32.99	13.94	53.07
184	Sahagan	190	170	20	150	134	16	40	36	4	396	131	265	25.60	6.83	67.58

185	Uttarkota	48	41	7	32	30	2	16	11	5	112	32	80	20.00	10.00	70.00
186	Biruanpada	88	77	11	82	73	9	6	4	2	188	52	136	29.71	2.17	68.12
187	Mangarajpur	105	104	1	99	98	1	6	6	0	240	68	172	28.70	1.74	69.57
188	Uttarakhajira	118	114	4	116	112	4	2	2	0	300	95	205	27.75	0.48	71.77
189	Kantapal	103	90	13	84	80	4	19	10	9	205	55	150	27.27	6.17	66.56
190	Baragadia	588	536	52	538	501	37	50	35	15	1735	655	1080	23.16	2.15	74.69
191	Ambapal	404	222	182	27	27	0	377	195	182	416	182	234	3.29	45.98	50.73
192	Nigodha	94	92	2	81	81	0	13	11	2	290	99	191	21.09	3.39	75.52
193	Chhanchania	27	26	1	13	13	0	14	13	1	36	9	27	20.63	22.22	57.14
194	Sansailo	924	755	169	858	718	140	66	37	29	1979	735	1244	29.56	2.27	68.17
195	Gorakhapur	30	30	0	30	30	0	0	0	0	71	22	49	29.70	0.00	70.30
196	Pandiapada	14	13	1	6	6	0	8	7	1	25	6	19	15.38	20.51	64.10
197	Khaira	112	98	14	110	97	13	2	1	1	229	74	155	32.26	0.59	67.16
198	Bandalo	1134	909	225	509	479	30	625	430	195	2262	751	1511	14.99	18.40	66.61
199	Jagulaigadia	163	160	3	162	159	3	1	1	0	462	149	313	25.92	0.16	73.92
200	Kankadajhar	192	175	17	98	89	9	94	86	8	379	126	253	17.16	16.46	66.37
201	Duburi	1365	1222	143	1259	1146	113	106	76	30	2914	923	1991	29.42	2.48	68.10
202	Santasahi	363	357	6	356	350	6	7	7	0	940	305	635	27.32	0.54	72.14
203	Bandhagan	757	459	298	492	354	138	265	105	160	1171	479	692	25.52	13.74	60.74
204	Kaduabandi	419	278	141	219	209	10	200	69	131	576	239	337	22.01	20.10	57.89
205	Saransa	93	88	5	86	84	2	7	4	3	172	55	117	32.45	2.64	64.91
206	Khajurinalua	429	221	208	171	165	6	258	56	202	109	47	62	31.78	47.96	20.26
207	Gobaragali	41	39	2	21	20	1	20	19	1	68	15	53	19.27	18.35	62.39
208	Gopinathpur	107	103	4	94	92	2	13	11	2	270	84	186	24.93	3.45	71.62
209	Jemadeipur	220	105	115	31	28	3	189	77	112	289	144	145	6.09	37.13	56.78
210	Khajuribindha	48	24	24	16	16	0	32	8	24	8	3	5	28.57	57.14	14.29
211	Kaliapal	110	107	3	86	83	3	24	24	0	270	84	186	22.63	6.32	71.05
212	Galiachhanda	221	194	27	211	186	25	10	8	2	391	118	273	34.48	1.63	63.89
213	Raghunathpu	93	63	30	57	54	3	36	9	27	132	54	78	25.33	16.00	58.67
214	Arjunjhar	229	117	112	223	113	110	6	4	2	200	92	108	51.98	1.40	46.62
215	Sundarapokhari	133	128	5	76	72	4	57	56	1	245	69	176	20.11	15.08	64.81

216	Rahemanpur	264	236	28	205	192	13	59	44	15	585	188	397	24.15	6.95	68.90
217	Akhanpur	89	89	0	10	10	0	79	79	0	186	56	130	3.64	28.73	67.64
218	Baragaji	278	156	122	277	156	121	1	0	1	320	151	169	46.32	0.17	53.51
219	Routapada	110	107	3	107	104	3	3	3	0	301	96	205	26.03	0.73	73.24
220	Kantipur	165	161	4	163	160	3	2	1	1	484	175	309	25.12	0.31	74.58
221	Kusumundia	84	73	11	24	21	3	60	52	8	569	254	315	3.68	9.19	87.14
222	Gantayatkate	229	123	106	83	77	6	146	46	100	232	109	123	18.00	31.67	50.33
223	Ashokjhar	242	210	32	234	204	30	8	6	2	477	151	326	32.55	1.11	66.34
224	Dhapanki	103	101	2	54	54	0	49	47	2	287	97	190	13.85	12.56	73.59
225	Kankadagadia	7	7	0	6	6	0	1	1	0	11	4	7	33.33	5.56	61.11
226	Krishnapur sasan	106	99	7	84	77	7	22	22	0	284	103	181	21.54	5.64	72.82
227	Bhalukipatala	459	277	182	259	225	34	200	52	148	714	342	372	22.08	17.05	60.87
228	Mohammadh osenpur	245	146	99	193	132	61	52	14	38	273	117	156	37.26	10.04	52.70
229	Itapur	22	22	0	18	18	0	4	4	0	47	14	33	26.09	5.80	68.12
230	Bagira	52	51	1	50	49	1	2	2	0	124	42	82	28.41	1.14	70.45
231	Dudhajori	422	331	91	307	298	9	115	33	82	653	224	429	28.56	10.70	60.74
232	Naguan	161	150	11	117	111	6	44	39	5	405	124	281	20.67	7.77	71.55
233	Padi	65	65	0	65	65	0	0	0	0	224	89	135	22.49	0.00	77.51
234	Tarapada	69	68	1	65	65	0	4	3	1	268	97	171	19.29	1.19	79.53
235	Taharpur	288	248	40	267	237	30	21	11	10	765	311	454	25.36	1.99	72.65
236	Nayagarh	181	147	34	141	128	13	40	19	21	297	115	182	29.50	8.37	62.13
237	Sarasada	206	195	11	114	107	7	92	88	4	529	185	344	15.51	12.52	71.97
238	Salakana	77	74	3	76	73	3	1	1	0	245	85	160	23.60	0.31	76.09
239	Barighodha	296	283	13	282	269	13	14	14	0	752	226	526	26.91	1.34	71.76
240	Hatimunda	15	13	2	14	13	1	1	0	1	35	11	24	28.00	2.00	70.00
241	Kandaragadia	41	40	1	38	37	1	3	3	0	101	37	64	26.76	2.11	71.13
242	Olia	432	310	122	398	294	104	34	16	18	721	285	436	34.52	2.95	62.53
243	Banahara	38	22	16	38	22	16	0	0	0	37	17	20	50.67	0.00	49.33
244	Sainto	85	84	1	84	84	0	1	0	1	232	80	152	26.50	0.32	73.19
245	Kankadapal	370	279	91	208	202	6	162	77	85	672	244	428	19.96	15.55	64.49
246	Sisua	29	25	4	28	24	4	1	1	0	74	26	48	27.18	0.97	71.84

247	Abhayapur	243	233	10	217	207	10	26	26	0	673	239	434	23.69	2.84	73.47
248	Mulasaragada	139	133	6	24	21	3	115	112	3	345	126	219	4.96	23.76	71.28
249	Bantala	68	67	1	63	62	1	5	5	0	258	101	157	19.33	1.53	79.14
250	Fazalpur	1011	879	132	774	730	44	237	149	88	2067	716	1351	25.15	7.70	67.15
251	Rangaranga	334	257	77	315	244	71	19	13	6	629	233	396	32.71	1.97	65.32
252	Khilipankha	155	151	4	142	140	2	13	11	2	389	123	266	26.10	2.39	71.51
253	Nizigarh	1983	1631	352	1652	1456	196	331	175	156	4286	1559	2727	26.35	5.28	68.37
254	Kuanrada	173	165	8	157	149	8	16	16	0	384	115	269	28.19	2.87	68.94
255	Gadapur	38	15	23	20	8	12	18	7	11	328	176	152	5.46	4.92	89.62
256	Brahmanda	96	90	6	67	63	4	29	27	2	216	59	157	21.47	9.29	69.23
257	Sukaran	592	397	195	351	284	67	241	113	128	908	360	548	23.40	16.07	60.53
258	Aladajalasar Pur	331	296	35	273	258	15	58	38	20	849	297	552	23.14	4.92	71.95
259	Barapal	112	69	43	6	5	1	106	64	42	172	62	110	2.11	37.32	60.56
260	Damodar pur	771	619	152	600	538	62	171	81	90	1587	620	967	25.45	7.25	67.30
261	Palasa	149	141	8	144	136	8	5	5	0	334	100	234	29.81	1.04	69.15
262	Ranasarapur	122	119	3	122	119	3	0	0	0	356	119	237	25.52	0.00	74.48
263	Baladia	91	89	2	77	76	1	14	13	1	227	75	152	24.21	4.40	71.38
264	Jamupasi	509	413	96	322	299	23	187	114	73	1056	404	652	20.58	11.95	67.48
265	Bhakandari	337	308	29	260	247	13	77	61	16	687	221	466	25.39	7.52	67.09
266	Baghanata	54	54	0	49	49	0	5	5	0	123	33	90	27.68	2.82	69.49
267	Kanchichua	274	157	117	269	155	114	5	2	3	348	153	195	43.25	0.80	55.95
268	Kharajabatira	206	197	9	35	33	2	171	164	7	563	195	368	4.55	22.24	73.21
269	Mangal pur	396	369	27	391	367	24	5	2	3	1049	380	669	27.06	0.35	72.60
270	Adhagan	95	94	1	94	93	1	1	1	0	234	79	155	28.57	0.30	71.12
271	Bartamana	240	229	11	240	229	11	0	0	0	535	140	395	30.97	0.00	69.03
272	Mrutunjayapu	513	481	32	205	197	8	308	284	24	1161	406	755	12.25	18.40	69.35
273	Depada	34	34	0	33	33	0	1	1	0	81	26	55	28.70	0.87	70.43
274	Ranigoda	503	470	33	407	391	16	96	79	17	1066	354	712	25.94	6.12	67.94
275	Gobindapur	328	231	97	213	183	30	115	48	67	368	132	236	30.60	16.52	52.87
276	Mirigi chara	399	245	154	275	234	41	124	11	113	578	243	335	28.15	12.69	59.16
277	Sata bainsia	50	49	1	50	49	1	0	0	0	185	57	128	21.28	0.00	78.72

278	Pubal	300	228	72	217	190	27	83	38	45	558	237	321	25.29	9.67	65.03
279	Jakha pura	1277	1178	99	1160	1075	85	117	103	14	2875	974	1901	27.94	2.82	69.24
280	Ochinda	143	137	6	110	107	3	33	30	3	359	115	244	21.91	6.57	71.51
281	Ampolaba	412	365	47	344	329	15	68	36	32	846	284	562	27.34	5.41	67.25
282	Ranapal	368	275	93	156	140	16	212	135	77	598	225	373	16.15	21.95	61.90
283	Khaira dihi	326	314	12	273	265	8	53	49	4	752	250	502	25.32	4.92	69.76
284	Begana	121	120	1	7	6	1	114	114	0	295	91	204	1.68	27.40	70.91
285	Chillipada	200	109	91	180	98	82	20	11	9	128	68	60	54.88	6.10	39.02
286	Gunduchi	374	237	137	204	185	19	170	52	118	565	229	336	21.73	18.10	60.17
287	Mulari	177	151	26	93	91	2	84	60	24	339	113	226	18.02	16.28	65.70
288	Karada	805	728	77	387	364	23	418	364	54	1846	606	1240	14.60	15.77	69.63
289	Khosalapur	33	30	3	10	9	1	23	21	2	69	28	41	9.80	22.55	67.65
290	Barapada	108	97	11	30	28	2	78	69	9	260	78	182	8.15	21.20	70.65
291	Balunga	293	280	13	291	279	12	2	1	1	712	221	491	28.96	0.20	70.85
292	Taja pur	265	178	87	247	172	75	18	6	12	357	124	233	39.71	2.89	57.40
293	Benapur	162	87	75	155	84	71	7	3	4	107	57	50	57.62	2.60	39.78
294	Khasa gadia	144	121	23	143	121	22	1	0	1	291	100	191	32.87	0.23	66.90
295	Brajanagar	238	225	13	145	141	4	93	84	9	452	146	306	21.01	13.48	65.51
296	Kharadi	471	385	86	360	323	37	111	62	49	1067	404	663	23.41	7.22	69.38
297	Bada barunei pada	236	196	40	116	112	4	120	84	36	384	130	254	18.71	19.35	61.94
298	Janha	712	642	70	556	508	48	156	134	22	1477	491	986	25.40	7.13	67.47
299	Ghikoili	58	56	2	35	34	1	23	22	1	133	36	97	18.32	12.04	69.63
300	Pathara pada	780	597	183	662	535	127	118	62	56	1307	499	808	31.72	5.65	62.63
301	Taluri	132	108	24	70	65	5	62	43	19	240	76	164	18.82	16.67	64.52
302	Dasamania	275	262	13	183	177	6	92	85	7	786	257	529	17.25	8.67	74.08
303	Pancha batia	12	11	1	7	7	0	5	4	1	39	16	23	13.73	9.80	76.47
304	Badasulidiha	432	334	98	206	179	27	226	155	71	1123	425	698	13.25	14.53	72.22
305	Rachhi pur	817	711	106	604	570	34	213	141	72	1757	607	1150	23.47	8.28	68.26
306	Chhotara pur	369	353	16	343	329	14	26	24	2	756	245	511	30.49	2.31	67.20
307	Nuapada	128	126	2	127	125	2	1	1	0	284	92	192	30.83	0.24	68.93
308	Ambasara	360	290	70	169	157	12	191	133	58	842	282	560	14.06	15.89	70.05

309	Rudhia	234	218	16	230	214	16	4	4	0	639	230	409	26.35	0.46	73.20
310	Oupada	55	50	5	53	48	5	2	2	0	135	47	88	27.89	1.05	71.05
311	Janha kana	139	133	6	134	128	6	5	5	0	420	143	277	23.97	0.89	75.13
312	Tailada	32	19	13	18	16	2	14	3	11	50	21	29	21.95	17.07	60.98
313	Bajarapada	67	66	1	28	27	1	39	39	0	169	53	116	11.86	16.53	71.61
314	Mohammed jamalpur	171	159	12	165	153	12	6	6	0	430	148	282	27.45	1.00	71.55
315	Raitikar	253	241	12	187	178	9	66	63	3	608	175	433	21.72	7.67	70.62
316	Alatiri	1037	790	247	974	748	226	63	42	21	1757	651	1106	34.86	2.25	62.88
317	Khaira bad	65	63	2	60	59	1	5	4	1	158	42	116	26.91	2.24	70.85
318	Nara pada	358	215	143	161	138	23	197	77	120	287	127	160	24.96	30.54	44.50
319	Kuru pada	468	253	215	290	223	67	178	30	148	230	112	118	41.55	25.50	32.95
320	Rabana	548	491	57	487	456	31	61	35	26	1470	528	942	24.13	3.02	72.84
321	Bhiki pur	255	233	22	136	126	10	119	107	12	463	128	335	18.94	16.57	64.48
322	Manohar pur	560	525	35	401	391	10	159	134	25	1292	431	861	21.65	8.59	69.76
323	Dania bar	511	497	14	299	294	5	212	203	9	1190	391	799	17.58	12.46	69.96
324	Badhei tikar	187	143	44	127	114	13	60	29	31	310	98	212	25.55	12.07	62.37
325	Hetagadia	54	52	2	54	52	2	0	0	0	124	37	87	30.34	0.00	69.66
326	Soti	552	529	23	536	515	21	16	14	2	1235	416	819	29.99	0.90	69.11
327	Namatikiri	173	169	4	18	17	1	155	152	3	386	122	264	3.22	27.73	69.05
328	Balia pasi	106	97	9	62	58	4	44	39	5	193	51	142	20.74	14.72	64.55
329	Brahman bad	54	53	1	53	52	1	1	1	0	157	55	102	25.12	0.47	74.41
330	Khaman	1220	1123	97	1034	964	70	186	159	27	2726	916	1810	26.20	4.71	69.08
331	Pahanga	760	698	62	483	453	30	277	245	32	1833	617	1216	18.63	10.68	70.69
332	Nahanda	157	151	6	131	127	4	26	24	2	318	100	218	27.58	5.47	66.95
333	Matabad	403	392	11	401	390	11	2	2	0	913	274	639	30.47	0.15	69.38
334	Sendhapur	224	147	77	110	96	14	114	51	63	263	102	161	22.59	23.41	54.00
335	Chhatra kana	202	154	48	157	146	11	45	8	37	353	119	234	28.29	8.11	63.60
336	Krushnnagar	211	197	14	211	197	14	0	0	0	447	139	308	32.07	0.00	67.93
337	Kaitha	538	525	13	508	496	12	30	29	1	1399	475	924	26.23	1.55	72.23
338	Krushnanagar patna	114	108	6	112	107	5	2	1	1	269	91	178	29.24	0.52	70.23
339	Gobinda pur	60	53	7	37	34	3	23	19	4	110	33	77	21.76	13.53	64.71

340	Laxmi nagar	792	708	84	355	315	40	437	393	44	1795	604	1191	13.72	16.89	69.39
341	Gotutha	4	4	0	4	4	0	0	0	0	8	1	7	33.33	0.00	66.67
342	Tara pur	278	246	32	127	115	12	151	131	20	622	212	410	14.11	16.78	69.11
343	Sala pada	182	175	7	116	114	2	66	61	5	371	105	266	20.98	11.93	67.09
344	Balarampur	18	12	6	16	10	6	2	2	0	36	17	19	29.63	3.70	66.67
345	Naudapur	280	263	17	265	252	13	15	11	4	550	170	380	31.93	1.81	66.27
346	Brahmangan	54	52	2	52	51	1	2	1	1	130	39	91	28.26	1.09	70.65
347	Khajuri pur	59	59	0	40	40	0	19	19	0	101	25	76	25.00	11.88	63.13
348	Jokadia	264	256	8	218	212	6	46	44	2	529	158	371	27.49	5.80	66.71
349	Khapuria	388	371	17	262	249	13	126	122	4	951	319	632	19.57	9.41	71.02
350	Rampur	185	182	3	175	172	3	10	10	0	434	132	302	28.27	1.62	70.11
351	Serapur	97	89	8	33	26	7	64	63	1	260	89	171	9.24	17.93	72.83
352	Nuapatna	84	81	3	64	62	2	20	19	1	198	61	137	22.70	7.09	70.21
353	Jalaka	206	194	12	194	184	10	12	10	2	560	198	362	25.33	1.57	73.11
354	Khandara pur	76	70	6	76	70	6	0	0	0	141	46	95	35.02	0.00	64.98
355	Goleipur	452	423	29	378	368	10	74	55	19	968	309	659	26.62	5.21	68.17
356	Badabiruan	828	719	109	615	558	57	213	161	52	1657	531	1126	24.75	8.57	66.68
357	Godipatana	250	229	21	193	183	10	57	46	11	528	162	366	24.81	7.33	67.87
358	Benga madha pur	85	82	3	80	79	1	5	3	2	237	79	158	24.84	1.55	73.60
359	Salapari	32	26	6	23	21	2	9	5	4	55	16	39	26.44	10.34	63.22
360	Rautra pur	466	440	26	358	352	6	108	88	20	929	270	659	25.66	7.74	66.59
361	Telia	109	107	2	106	104	2	3	3	0	244	67	177	30.03	0.85	69.12
362	Sana biruan	272	258	14	246	238	8	26	20	6	561	174	387	29.53	3.12	67.35
363	Mangaraj pur	161	156	5	151	146	5	10	10	0	288	81	207	33.63	2.23	64.14
364	Banamali pur	200	185	15	181	174	7	19	11	8	413	116	297	29.53	3.10	67.37
365	Banja	286	276	10	119	111	8	167	165	2	662	219	443	12.55	17.62	69.83
366	Chhatra kana	202	154	48	157	146	11	45	8	37	353	119	234	28.29	8.11	63.60
367	Kumudisasan	44	43	1	44	43	1	0	0	0	155	60	95	22.11	0.00	77.89
368	Talagarh	645	609	36	535	516	19	110	93	17	1461	494	967	25.40	5.22	69.37
369	Hatapur	85	84	1	83	82	1	2	2	0	236	71	165	25.86	0.62	73.52
370	Radha nagar	54	30	24	31	16	15	23	14	9	30	16	14	36.90	27.38	35.71

371	Solapur	796	411	385	539	343	196	257	68	189	603	300	303	38.53	18.37	43.10
372	Charada	118	112	6	14	11	3	104	101	3	338	121	217	3.07	22.81	74.12
373	Dhantri	251	245	6	160	155	5	91	90	1	606	187	419	18.67	10.62	70.71

In KEONJHAR District

Sl. No.	Name	Working Population			Main Worker			Marginal Worker			Non Worker			Percentage		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Main Worker	Marginal Worker	Non Worker
1	Indupura	132	129	3	107	104	3	25	25	0	398	137	261	20.19	4.15	75.09
2	Jenapada	175	159	16	151	`48	3	24	11	13	299	68	231	31.86	5.06	63.08
3	Nandabar	452	387	65	345	336	9	107	84	23	798	231	567	27.60	4.56	63.84
4	Baranga	481	400	81	367	341	26	114	80	34	1010	345	665	24.61	5.50	67.74
5	Beguniadihi	103	101	2	99	97	2	4	4	0	439	176	263	18.27	0.74	81.00
6	Tukuna	403	369	34	160	144	16	243	185	58	1023	356	667	11.22	13.74	71.74
7	Banika	241	225	16	238	222	16	3	3	0	638	231	407	27.08	0.23	72.58
8	Hatibandha	268	250	18	254	240	14	14	13	1	552	170	382	30.98	0.61	67.32
9	Madanpur	793	736	57	414	400	14	379	362	17	1743	562	1181	16.32	12.74	68.73
10	Hasanpur	155	146	9	153	144	9	2	2	0	403	151	252	27.42	0.36	72.22
11	Nayagarh	771	395	376	329	122	207	442	350	92	498	237	261	10.17	14.34	39.24
12	Rudranarayanpur	144	136	8	98	94	4	46	45	1	436	150	286	16.90	7.24	75.17
13	Machhalo	580	550	30	514	501	13	66	42	24	1420	440	980	25.70	2.60	71.00
14	Pandua	337	160	177	145	143	2	192	17	175	278	127	151	23.58	31.06	45.20
15	Karadapal	779	402	377	163	121	42	616	331	285	789	355	434	10.40	34.25	50.32
16	Bato	534	508	26	380	361	19	154	147	7	1210	363	847	21.79	8.83	69.38
17	Tampo	61	57	4	56	53	3	5	4	1	168	56	112	24.45	2.18	73.36
18	Sainkul P.S	23755	21596	2159	18988	17944	1044	4767	3214	1553	54938	18223	36715	24.13	5.12	69.81
19	Kolhabarapada	682	436	246	481	359	122	201	93	108	1047	438	609	27.82	9.43	60.56
20	Paramanandapur	42	26	16	24	19	5	18	12	6	55	15	40	24.74	11.34	56.70
21	Khalana	1050	927	123	674	643	31	376	286	90	2108	696	1412	21.34	11.27	66.75
22	Dantia	304	270	34	297	266	31	7	4	3	722	194	528	28.95	0.68	70.37
23	Lunahar	173	168	5	72	68	4	101	89	12	434	126	308	11.86	9.88	71.50
24	Patasura	209	203	6	206	202	4	3	1	2	376	97	279	35.21	0.51	64.27
25	Taruan	361	347	14	338	326	12	23	21	2	1022	346	676	24.44	1.16	73.90
26	Brahmanapanga	360	173	187	146	131	15	214	46	168	241	123	118	24.29	34.61	40.10
27	Kendukhunta	169	157	12	166	154	12	3	3	0	457	173	284	26.52	0.48	73.00
28	Ramachandrapur	233	215	18	202	193	9	31	19	12	686	253	433	21.98	2.83	74.65

29	Baranga	241	213	28	80	72	8	161	142	19	762	287	475	7.98	15.95	75.97
30	Angarua	406	389	17	340	326	14	66	49	17	1207	450	757	21.08	3.16	74.83
31	Mathianendi	125	115	10	124	114	10	1	1	0	226	58	168	35.33	0.28	64.39
32	Tigiria	174	86	88	12	11	1	162	77	85	168	84	84	3.51	46.78	49.12
33	Alati	623	601	22	485	472	13	138	121	17	1677	605	1072	21.09	5.65	72.91
34	Raitola	304	288	16	278	265	13	26	22	4	570	147	423	31.81	2.86	65.22
35	Krushnapur	189	113	76	189	113	76	0	0	0	271	115	156	41.09	0.00	58.91
36	Ghasipura P.S	38382	30703	7679	25803	23607	2196	12579	8523	4056	74358	26118	48240	21.88	9.38	65.96
37	Purunian	349	328	21	292	276	16	57	51	6	970	352	618	22.14	4.09	73.54
38	Naduan	302	289	13	271	261	10	31	25	6	883	307	576	2.29	0.24	7.45
39	Balarampur	420	390	30	289	270	19	131	112	19	1160	452	708	18.29	5.76	73.42
40	Belabhali	1209	1141	68	1025	949	76	184	175	9	3193	1151	2042	22.81	4.18	72.54
41	Mangalpur	482	246	236	216	190	26	266	59	207	390	205	185	24.77	29.59	44.72
42	Paikchatra	228	215	13	203	191	12	25	24	1	455	143	312	29.72	3.66	66.62
43	Jalasuan	258	225	33	251	218	33	7	7	0	616	214	402	28.72	0.80	70.48
44	Suanpada	225	209	16	219	205	14	6	4	2	523	166	357	29.28	0.80	69.92
45	Dhinkia	184	168	16	121	115	6	63	56	7	409	127	282	20.40	9.95	68.97
46	Kodapada	738	629	109	578	547	31	160	82	78	1420	488	932	26.78	7.41	65.80
47	Gobindapur	329	283	46	279	257	22	50	26	24	783	299	484	25.09	4.50	70.41
48	Gohirabani	379	188	191	255	161	94	124	27	97	198	99	99	44.19	21.49	34.32
49	Talagaon	672	452	220	390	324	66	282	128	154	1022	392	630	23.02	16.65	60.33
50	Sadangi	709	411	298	321	264	57	388	147	241	618	273	345	24.19	29.24	46.57
51	Gohira	902	526	376	184	168	16	718	358	360	988	419	569	9.74	37.99	52.28
52	Anandpur (M)	12472	10691	1781	10499	9218	1281	1973	1473	500	27113	9771	17342	26.52	4.98	68.49
53	Palaspur	21	21	0	13	13	0	8	8	0	41	10	31	20.97	12.90	66.13
54	Kumunia	435	232	203	137	122	15	298	110	188	349	165	184	17.47	38.01	44.52
55	Indupura	132	129	3	107	104	3	25	25	0	398	137	261	20.19	4.72	75.09
56	Kainpura	268	251	17	266	249	17	2	2	0	748	246	502	26.18	0.20	73.62
57	Jhadakhundi	245	229	16	117	112	5	128	117	11	517	148	369	15.35	16.80	67.85
58	Chamuhin	100	93	7	92	87	5	8	6	2	285	101	184	23.90	2.08	74.03
59	Vatisira	171	160	11	145	134	11	26	26	0	372	119	253	26.70	4.79	68.51
60	Bancho	1060	1007	53	820	779	41	240	228	12	2510	787	1723	22.97	6.72	70.31

61	Bailo	368	350	18	230	213	17	138	137	1	1035	354	681	16.39	9.84	73.77
62	Guhalia	366	320	46	326	306	20	40	14	26	614	173	441	33.27	4.08	62.65
63	Nuapada	461	245	216	129	121	8	332	124	208	439	207	232	14.33	36.89	48.78
64	Banika	241	225	16	238	222	16	3	3	0	638	231	407	27.08	0.34	72.58
65	Khadibil	260	247	13	18	11	7	242	236	6	768	274	494	1.75	23.54	74.71
66	Barigaon	457	318	139	281	253	28	176	65	111	554	214	340	27.79	17.41	54.80
67	Hatibandha	268	250	18	254	240	14	14	10	4	552	170	382	30.98	1.71	67.32
68	Panchupali	1643	1553	90	1025	979	46	618	574	44	3772	1225	2547	18.93	11.41	69.66
69	Sibanarayanpur	82	57	25	55	44	11	27	13	14	162	54	108	22.54	11.07	66.39
70	Atasahipatana	162	151	11	147	136	11	15	15	0	463	167	296	23.52	2.40	74.08
71	Atasahi	391	377	14	321	313	8	70	64	6	965	304	661	23.67	5.16	71.17
72	Sarei	854	443	411	533	345	188	321	98	223	606	282	324	36.51	21.99	41.51
73	Hatisila	194	97	97	68	59	9	126	38	88	166	98	68	18.89	35.00	46.11
74	Kochianendi	296	238	58	286	234	52	10	4	6	516	168	348	35.22	1.23	63.55
75	Satatira	371	354	17	236	230	6	135	124	11	734	206	528	21.36	12.22	66.43
76	Raghabpur	144	137	7	88	83	5	56	54	2	424	154	270	15.49	9.86	74.65
77	Deogaon	86	45	41	86	45	41	0	0	0	95	34	61	47.51	0.00	52.49
78	Adghuria	227	219	8	44	41	3	183	178	5	689	236	453	4.80	19.98	75.22
79	Bhaganai	410	394	16	353	346	7	57	48	9	975	295	680	25.49	4.12	70.40
80	Tolankapada	634	610	24	561	542	19	73	68	5	1653	587	1066	24.53	3.19	72.28
81	Kanpur	177	171	6	170	164	6	7	7	0	547	217	330	23.48	0.97	75.55
82	Uchabali	328	222	106	226	179	47	102	43	59	474	192	282	28.18	12.72	59.10
83	Dipapal	139	132	7	126	121	5	13	11	2	255	64	191	31.98	3.30	64.72
84	Sanabadabila	471	242	229	173	156	17	298	86	212	312	149	163	22.09	38.06	39.85
85	Dhinkia	184	168	16	121	115	6	63	53	10	409	127	282	20.40	10.62	68.97
86	Hirapur	87	46	41	61	42	19	26	4	22	66	27	39	39.87	16.99	43.14
87	Siapada	178	172	6	172	170	2	6	2	4	340	90	250	33.20	1.16	65.64
88	Sahanadpur	48	44	4	47	44	3	1	0	1	91	24	67	33.81	0.72	65.47
89	Mugupur	90	87	3	67	66	1	23	21	2	277	87	190	18.26	6.27	75.48
90	Haridapal	198	190	8	166	158	8	32	32	0	445	137	308	25.82	4.98	69.21
91	Tikara	166	159	7	164	157	7	2	2	0	371	125	246	30.54	0.37	69.09
92	Godipatna	112	103	9	112	103	9	0	0	0	290	101	189	27.86	0.00	72.14

93	Tarava	247	235	12	242	232	10	5	3	2	536	171	365	30.91	0.64	68.45
94	Naukana	64	64	0	62	62	0	2	2	0	172	50	122	26.27	0.85	72.88
95	Bamphidi	473	361	112	259	251	8	214	110	104	771	260	511	20.82	17.20	61.98
96	Nayagarh	771	395	376	129	122	7	642	273	369	498	237	261	10.17	50.59	39.24
97	Ambo	354	327	27	220	208	12	134	119	15	837	264	573	18.47	11.25	70.28
98	Pahadpur	300	166	134	146	136	10	154	30	124	429	202	227	20.03	21.12	58.85
99	Panchara	301	261	40	208	198	10	93	63	30	642	201	441	22.06	9.86	68.08
100	Patilo	199	179	20	195	175	20	4	4	0	468	156	312	29.24	0.60	70.16
101	Khadikasulabahali	333	313	20	280	265	15	53	48	5	716	228	488	26.69	5.05	68.26
102	Kothasahi	99	94	5	96	91	5	3	3	0	185	58	127	33.80	1.06	65.14
103	Anjira	95	87	8	86	84	2	9	3	6	240	84	156	25.67	2.69	71.64
104	Fatepur	23	22	1	21	21	0	2	1	1	74	27	47	21.65	2.06	76.29
105	Agarda	245	234	11	223	215	8	22	19	3	582	183	399	26.96	2.66	70.37
106	Nuagaon	344	277	67	302	255	47	42	22	20	633	233	400	30.91	4.30	64.79
107	Madhukesari	430	413	17	162	155	7	268	258	10	984	345	639	11.46	18.95	69.59
108	Dihakatina	43	31	12	31	26	5	12	5	7	82	33	49	24.80	9.60	65.60
109	Garhbandhogoda	666	617	49	625	585	40	41	32	9	1659	571	1088	26.88	1.76	71.35
110	Malikatina	74	56	18	66	54	12	8	2	6	208	81	127	23.40	2.84	73.76
111	Gainthagodi	26	26	0	26	26	0	0	0	0	61	15	46	29.89	0.00	70.11
112	Atta	501	470	31	480	453	27	21	17	4	1206	386	820	28.12	1.23	70.65
113	Kainsiari	191	154	37	146	126	20	45	28	17	212	54	158	36.23	11.17	52.61
114	Ullol	265	246	19	222	210	12	43	36	7	633	202	431	24.72	4.79	70.49
115	Mangalagadia	42	40	2	40	38	2	2	2	0	116	38	78	25.32	1.27	73.42
116	Girigaon	330	317	13	281	270	11	49	47	2	672	204	468	28.04	4.89	67.07
117	Kantabania	131	120	11	107	100	7	24	20	4	341	109	232	22.67	5.08	72.25
118	Chandali	138	126	12	138	126	12	0	0	0	299	92	207	31.58	0.00	68.42
119	Baharipur	248	225	23	90	80	10	158	145	13	635	231	404	10.19	17.89	71.91
120	Jarak	99	83	16	99	83	16	0	0	0	186	63	123	34.74	0.00	65.26
121	Sanapadana	109	102	7	87	81	6	22	21	1	242	68	174	24.79	6.27	68.95
122	Bahugadia	26	25	1	26	25	1	0	0	0	77	23	54	25.24	0.00	74.76
123	Haripur	87	86	1	72	71	1	15	15	0	231	78	153	22.64	4.72	72.64
124	Baniapasi	482	261	221	198	186	12	284	75	209	354	140	214	23.68	33.97	42.34

125	Bramhanda	127	124	3	125	122	3	2	2	0	396	138	258	23.90	0.38	75.72
126	Suanlo	216	206	10	212	203	9	4	3	1	520	172	348	28.80	0.54	70.65
127	Valuka	133	129	4	133	129	4	0	0	0	321	95	226	29.30	0.00	70.70
128	Napanga	110	103	7	103	100	3	7	3	4	294	100	194	25.50	1.73	72.77
129	Mahuri	169	165	4	167	163	4	2	2	0	482	170	312	25.65	0.31	74.04
130	Ujuni	140	134	6	137	132	5	3	2	1	336	121	215	28.78	0.63	70.59
131	Balibaruan	97	94	3	97	94	3	0	0	0	238	82	156	28.96	0.00	71.04
132	Bhandaripada	33	31	2	25	24	1	8	7	1	86	32	54	21.01	6.72	72.27
133	Kaithapatna	110	101	9	94	87	7	16	14	2	306	92	214	22.60	3.85	73.56
134	Padanpur	687	639	48	496	479	17	191	160	31	1250	349	901	25.61	9.86	64.53
135	Badapadana	713	689	24	645	625	20	68	64	4	1644	495	1149	27.37	2.89	69.75
136	Saladei	361	342	19	349	331	18	12	11	1	1064	336	728	24.49	0.84	74.67
137	Kendukhunta	169	157	12	166	154	12	3	3	0	457	173	284	26.52	0.48	73.00
138	Samana	512	486	26	357	341	16	155	145	10	1056	345	711	22.77	9.89	67.35
139	Karadamali	73	70	3	67	64	3	6	6	0	197	69	128	24.81	2.22	72.96
140	Belasundari	200	179	21	193	172	21	7	7	0	560	191	369	25.39	0.92	73.68
141	Gudiadihi	121	106	15	87	84	3	34	22	12	246	84	162	23.71	9.26	67.03
142	Narda	174	162	12	150	139	11	24	23	1	443	197	246	24.31	3.89	71.80
143	Janardanpurpatna	138	122	16	127	115	12	11	7	4	325	124	201	27.43	2.38	70.19
144	Aligaon	102	95	7	99	93	6	3	2	1	195	53	142	33.33	1.01	65.66
145	Odapada	204	194	10	204	194	10	0	0	0	460	122	338	30.72	0.00	69.28
146	Purunabandhogoda	233	223	10	230	221	9	3	2	1	529	162	367	30.18	0.39	69.42
147	Jarda	174	167	7	164	157	7	10	10	0	382	118	264	29.50	1.80	68.71
148	Katenikantal	114	103	11	106	99	7	8	4	4	243	76	167	29.69	2.24	68.07
149	Sainpal	170	165	5	170	165	5	0	0	0	547	204	343	23.71	0.00	76.29
150	Bilabandha	199	168	31	162	148	14	37	20	17	401	127	274	27.00	6.17	66.83
151	Guhaldihi	50	49	1	38	37	1	12	12	0	104	30	74	24.68	7.79	67.53
152	Ganpur	7	7	0	5	5	0	2	2	0	53	22	31	8.33	3.33	88.33
153	Kolipal	207	194	13	80	76	4	127	118	9	398	129	269	13.22	20.99	65.79
154	Nuhamalia	524	306	218	229	224	5	295	82	213	610	240	370	20.19	26.01	53.79
155	Beladiha	229	133	96	101	92	9	128	40	88	234	86	148	20.95	27.65	50.54
156	Biragobindapur	1005	636	369	440	405	35	565	233	332	1249	504	745	19.52	24.80	55.41

157	Belada	104	85	19	104	85	19	0	0	0	248	101	147	29.55	0.00	70.45
158	Baunspal	1050	573	477	757	512	245	293	92	201	962	373	589	37.62	12.28	47.81
159	Gobargali	317	256	61	265	219	46	52	37	15	543	186	357	30.81	6.05	63.14

Occupational pattern of the study area (in Dhenkanal District):

Sl. No.	Village Name	Total	Main and Marginal												Percentage				Work Participation Rate
			Cultivators			Agricultural			Household Industries			Other workers			Cultivators	Agricultural	Household Industries	Other workers	
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female					
1.	Kanaka	402	4	3	1	32	30	2	15	14	1	71	50	21	3.28	26.23	12.30	58.20	30.35
2.	Kankarpur	150	6	3	3	23	8	15	0	0	0	38	35	3	8.96	34.33	0.00	56.72	44.67
3.	Analakata	830	120	115	5	90	84	6	5	5	0	52	45	7	44.94	33.71	1.87	19.48	32.17
4.	Jayapurakateni	2036	271	221	50	761	333	428	11	7	4	92	77	15	23.88	67.05	0.97	8.11	55.75
5.	Denga Bahali	435	15	14	1	156	60	96	0	0	0	32	27	5	7.39	76.85	0.00	15.76	46.67
6.	Kenduapada	650	1	0	1	362	171	191	13	6	7	14	12	2	0.26	92.82	3.33	3.59	60.00
7.	Bhuban P.S	101051	5410	5260	150	11261	9178	2083	1064	877	53	14697	10431	983	16.68	34.72	3.28	45.32	32.09
8.	Odisha	4021	248	241	7	310	234	76	30	28	2	739	554	185	18.69	23.36	2.26	55.69	33.00
9	Kumurasinga	530	23	21	2	40	40	0	13	13	0	93	86	7	13.61	23.67	7.69	55.03	31.89
10.	Kuninda	1626	129	128	1	217	192	25	17	12	5	130	119	11	26.17	44.02	3.45	26.37	30.32
11.	Khoksa(L)	296	21	20	1	3	3	0	0	0	0	73	69	4	21.65	3.09	0.00	75.26	32.77
12.	Khoksa(R)	333	21	19	2	2	2	0	2	2	0	85	84	1	19.09	1.82	1.82	77.27	33.03
13.	Baruan	1323	150	149	1	107	101	6	8	8	0	135	120	15	37.50	26.75	2.00	33.75	30.23
14.	Kansaragoda	1066	27	23	4	262	215	47	10	10	0	54	42	12	7.65	74.22	2.83	15.30	33.11
15.	Dhalapada	747	22	22	0	145	122	23	1	0	1	74	68	6	9.09	59.92	0.41	30.58	32.40
16.	Kainsiri	1250	87	87	0	132	131	1	3	3	0	154	138	16	23.14	35.11	0.80	40.96	30.08
17.	Muruga	1112	49	49	0	93	89	4	92	78	14	182	137	45	11.78	22.36	22.12	43.75	37.41
18.	Balijhati	569	27	26	1	47	23	24	4	4	0	139	115	24	12.44	21.66	1.84	64.06	38.14
19.	Anantapur	912	27	27	0	200	174	26	0	0	0	63	50	13	9.31	68.97	0.00	21.72	31.80
20.	Garudabandi	931	37	33	4	36	33	3	7	7	0	251	190	61	11.18	10.88	2.11	75.83	35.55
21.	Nayan nilakanthapur	448	9	9	0	102	101	1	1	0	1	29	26	3	6.38	72.34	0.71	20.57	31.47
22.	Patapur	392	58	57	1	49	40	9	24	9	15	10	7	3	41.13	34.75	17.02	7.09	35.97
23.	Jaypur	1429	27	25	2	246	241	5	5	5	0	180	163	17	5.90	53.71	1.09	39.30	32.05
24.	Kingol	667	30	28	2	202	126	76	8	8	0	41	37	4	10.68	71.89	2.85	14.59	42.13
25.	Kirtanpur	1240	41	40	1	306	247	59	7	3	4	86	73	13	9.32	69.55	1.59	19.55	35.48
26.	Bhusala	2302	122	118	4	198	196	2	19	19	0	350	331	19	17.71	28.74	2.76	50.80	29.93

27.	Praharajpur	102	3	3	0	4	4	0	1	1	0	26	25	1	8.82	11.76	2.94	76.47	33.33
28.	kanapalsamilmahulpal	3600	165	164	1	554	546	8	22	18	4	256	228	28	16.55	55.57	2.21	25.68	27.69
29.	Chandipal	1005	60	59	1	146	142	4	1	1	0	94	86	8	19.93	48.50	0.33	31.23	29.95
30.	Karadabani	1115	139	134	5	54	54	0	8	8	0	164	125	39	38.08	14.79	2.19	44.93	32.74
31.	Kanapal	207	2	1	1	65	51	14	2	1	1	15	8	7	2.38	77.38	2.38	17.86	40.58
32.	Sitalabasa	536	62	62	0	36	11	25	0	0	0	109	106	3	29.95	17.39	0.00	52.66	38.62
33.	Kankana	1704	60	59	1	489	251	238	11	9	2	268	236	32	7.25	59.06	1.33	32.37	48.59
34.	Anala	1487	122	118	4	103	82	21	8	7	1	256	239	17	24.95	21.06	1.64	52.35	32.89
35.	Senanda	240	2	2	0	83	50	33	4	2	2	14	12	2	1.94	80.58	3.88	13.59	42.92
36.	Brahmankhantakhol	212	1	1	0	80	56	24	0	0	0	21	19	2	0.98	78.43	0.00	20.59	48.11
37.	Hariamaru	139	32	32	0	0	0	0	7	7	0	24	4	20	50.79	0.00	11.11	38.10	45.32
38.	Kendupada	807	48	48	0	156	84	72	0	0	0	120	109	11	14.81	48.15	0.00	37.04	40.15
39.	Mathanuagan	834	39	33	6	148	123	25	14	7	7	95	82	13	13.18	50.00	4.73	32.09	35.49
40.	Balipada	22	0	0	0	0	0	0	0	0	0	10	7	3	0.00	0.00	0.00	100.00	45.45
41.	Renadapatana	906	95	93	2	119	89	30	6	6	0	111	97	14	28.70	35.95	1.81	33.53	36.53
42.	Palasapithia	1280	43	43	0	228	135	93	2	1	1	86	72	14	11.98	63.51	0.56	23.96	28.05
43.	Gabagoda	165	15	15	0	50	23	27	0	0	0	18	12	6	18.07	60.24	0.00	21.69	50.30
44.	Solagadia	1663	184	181	3	456	270	186	4	2	2	35	27	8	27.10	67.16	0.59	5.15	40.83
45.	Ichhapur	23	1	1	0	3	2	1	2	2	0	5	3	2	9.09	27.27	18.18	45.45	47.83
46	Basudeipur	572	30	30	0	67	56	11	2	2	0	71	66	5	17.65	39.41	1.18	41.76	29.72
47.	Dayanabili	819	59	57	2	172	106	66	37	35	2	120	58	62	15.21	44.33	9.54	30.93	47.37
48.	Gamargola	81	10	10	0	1	1	0	0	0	0	12	9	3	43.48	4.35	0.00	52.17	28.40
49.	Garhnrusinghaprasad	1753	66	65	1	228	198	30	77	33	44	234	198	36	10.91	37.69	12.73	38.68	34.51
50.	Anlajhari	1538	129	127	2	188	142	46	10	9	1	179	163	16	25.49	37.15	1.98	35.38	32.90
51.	Kankhai	720	49	49	0	317	175	142	0	0	0	47	43	4	11.86	76.76	0.00	11.38	57.36
52.	Kesharpur	500	16	16	0	110	100	10	2	1	1	20	15	5	10.81	74.32	1.35	13.51	29.60
53.	Balibo(L)	2573	203	201	2	159	152	7	36	36	0	340	322	18	27.51	21.54	4.88	46.07	28.68
54.	Samal	541	45	45	0	12	5	7	1	1	0	95	89	6	29.41	7.84	0.65	62.09	28.28
55.	Tipilei	1162	97	93	4	256	196	60	9	7	2	131	90	41	19.68	51.93	1.83	26.57	42.43
56.	Chhatakhamb	12	0	0	0	6	3	3	0	0	0	4	3	1	0.00	60.00	0.00	40.00	83.33
57.	Kumarda	237	0	0	0	157	90	67	0	0	0	3	2	1	0.00	98.13	0.00	1.88	67.51
58.	Dadhisinga	100	0	0	0	59	30	29	0	0	0	0	0	0	0.00	100.0	0.00	0.00	59.00
60.	Naraharipur	237	22	21	1	0	0	0	4	4	0	55	48	7	27.16	0.00	4.94	67.90	39.24
61.	Surapratappur	5776	710	689	21	539	476	63	22	20	2	491	448	43	40.30	30.59	1.25	27.87	1.40

62.	Kunda	1230	142	142	0	57	53	4	8	7	1	136	124	12	41.40	16.62	2.33	39.65	43.25
63.	Sundhikateni	1023	101	98	3	5	4	1	62	50	12	178	138	40	29.19	1.45	17.92	51.45	33.53
64.	Kanchanbahali	311	5	5	0	32	32	0	1	1	0	54	38	16	5.43	34.78	1.09	58.70	31.25
65.	Asurabandha	1173	33	28	5	175	118	57	4	3	1	197	180	17	8.07	42.79	0.98	48.17	17.84
66.	Arilo	78	0	0	0	23	20	3	0	0	0	1	0	1	0.00	95.83	0.00	4.17	24.36
67.	Gadganpur	1122	83	76	7	34	28	6	11	11	0	186	173	13	26.43	10.83	3.50	59.24	42.14
68.	Chandar	941	70	69	1	70	65	5	4	4	0	110	100	10	27.56	27.56	1.57	43.31	33.37
69.	Gopalpur	740	47	47	0	164	164	0	0	0	0	14	11	3	20.89	72.89	0.00	6.22	34.32
70.	Gobindabidyadharpur	92	0	0	0	23	21	2	0	0	0	4	4	0	0.00	85.19	0.00	14.81	44.57
71.	Malapura	1807	119	110	9	226	140	86	61	50	11	264	237	27	17.76	33.73	9.10	39.40	21.49
72.	Nimeinpur	987	73	72	1	41	39	2	0	0	0	141	132	9	28.63	16.08	0.00	55.29	67.88
73.	Rodanga	125	6	6	0	50	23	27	0	0	0	2	2	0	10.34	86.21	0.00	3.45	40.00
74.	Asurabandha Patana	926	52	52	0	104	100	4	9	8	1	129	120	9	17.69	35.37	3.06	43.88	60.26
75.	Mrudanga	2716	146	143	3	364	362	2	20	13	7	292	261	31	17.76	44.28	2.43	35.52	10.82
76.	Bentashalia	368	15	15	0	81	75	6	1	1	0	23	18	5	12.50	67.50	0.83	19.17	23.37
77.	Ekatali(Kha)	2009	154	154	0	127	127	0	5	5	0	249	231	18	28.79	23.74	0.93	46.54	25.97
78.	Ekatali(Ka)	101	3	3	0	4	4	0	0	0	0	20	19	1	11.11	14.81	0.00	74.07	29.70
79.	Brahmapur	111	1	1	0	7	7	0	6	5	1	21	20	1	2.86	20.00	17.14	60.00	24.32
80.	Majhipal	496	82	62	20	49	42	7	0	0	0	99	50	49	35.65	21.30	0.00	43.04	37.06
81.	Nilakanthapur	1023	70	70	0	229	202	27	2	0	2	54	48	5	19.72	64.51	0.56	15.21	22.48
82.	Sarangapur	97	0	0	0	24	24	0	1	1	0	7	6	1	0.00	75.00	3.13	21.88	65.98
83.	Hatibari	501	64	64	0	84	49	35	8	4	4	46	38	8	31.68	41.58	3.96	22.77	36.39
84.	Purastampur	1216	53	52	1	98	87	11	30	29	1	205	189	16	13.73	25.39	7.77	53.11	16.61
85.	Koriapal	1087	47	46	1	225	78	147	3	3	0	213	171	42	9.63	46.11	0.61	43.65	35.51
86.	Darjani	802	38	38	0	36	35	1	12	12	0	174	134	40	14.62	13.85	4.62	66.92	60.85
87.	Maluagoda	492	8	7	1	190	98	92	6	6	0	12	7	5	3.70	87.96	2.78	5.56	52.85
88.	Joragadia	85	0	0	0	31	18	13	0	0	0	11	11	0	0.00	73.81	0.00	26.19	54.12
89.	Kankadahad	458	177	137	40	479	298	181	9	9	0	222	185	37	19.95	54.00	1.01	25.04	41.95

In JAJPUR District:

Sl. No.	Village Name	Main and Marginal												Percentage				
		Cultivators			Agricultural			Household Industries			Other workers							
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Cultivators	Agricultural	Household Industries	Other workers	Work Participation Rate
1	Ichhapur	104	102	2	12	12	0	9	9	0	30	18	12	1	0	10	89	24.60
2	Jalanda	40	19	21	169	115	54	34	21	13	37	22	15	9.78	4	1.78	84.44	41.60
3	Tarakote	257	239	18	301	298	3	0	0	0	256	240	16	9.09	38.02	4.96	47.93	28.31
4	Barada	168	165	3	47	45	2	26	22	4	147	100	47	5.17	36.21	0	58.62	32.66
5	Tentulikhunta	39	39	0	25	23	2	2	2	0	98	94	4	29.7	10.02	2.15	58.13	29.13
6	Kayan	255	205	50	129	125	4	19	19	0	430	127	303	12.76	42.7	6.99	37.55	76.60
7	Tulati	36	35	1	68	66	2	20	15	5	164	147	17	29.27	42.55	3.25	24.93	26.06
8	Pimpal	128	75	53	95	32	63	2	1	1	60	50	10	14.55	65.67	1.12	18.66	59.13
9	Jaintala	26	26	0	27	25	2	1	1	0	34	32	2	35.77	22.63	0.72	40.88	30.03
10	Toranda	47	47	0	77	73	4	0	0	0	11	10	1	16.7	22.14	0.91	60.25	30.07
11	Solabandi	100	96	4	194	189	5	2	2	0	62	52	10	15.38	24.97	14.05	45.6	32.31
12	Chingudipur	40	39	1	0	0	0	0	0	0	11	11	0	14.42	19.28	10.68	55.62	28.65
13	Haladigadia	174	172	2	197	187	10	3	3	0	94	84	10	63.81	16.67	0.47	19.05	28.78
14	Kogan	31	22	9	85	50	35	67	64	3	8	7	1	26.46	38.77	5.77	29	41.61
15	Talagadia	24	23	1	57	52	5	10	7	3	42	39	3	25.41	12.3	1.64	60.65	15.56
16	Asanjhar	74	71	3	181	159	22	2	2	0	21	14	7	16.27	34.48	1.86	47.39	26.73
17	Ranapur	142	141	1	66	66	0	5	5	0	64	60	4	38.24	17.65	2.21	41.9	21.52
18	Gajendrapur	101	98	3	84	81	3	4	4	0	39	33	6	42.83	12.87	1.29	43.01	30.12
19	Jugala	36	35	1	156	154	2	0	0	0	29	24	5	15.47	52.07	0.65	31.81	30.82
20	Mathurapur	39	38	1	91	88	3	21	21	0	77	66	11	41.01	37.19	1.5	20.3	27.77
21	Nisankhapur	6	6	0	42	39	3	2	2	0	14	14	0	18.11	22.7	0.27	58.92	28.57
22	Salaba	66	66	0	237	82	155	0	0	0	22	19	3	28.16	16.02	1.01	54.81	56.82
23	Barundai	196	188	8	427	389	38	8	8	0	363	314	49	12.24	27.04	0.15	60.57	30.58
24	Bangarakota	153	150	3	106	99	7	6	6	0	197	186	11	24.8	36.97	0.16	38.07	26.51

25	Khiro	95	93	2	140	134	6	4	4	0	21	19	2	17.77	22.84	3.55	55.84	29.02
26	Banhara	80	50	30	72	30	42	2	2	0	4	2	2	11.83	44.62	0.54	43.01	57.04
27	Amrutia	379	377	2	208	184	24	7	7	0	80	70	10	30.66	16.98	3.3	49.06	29.96
28	Mulapal	47	44	3	42	35	7	1	0	1	43	36	7	7.98	18.52	3.16	70.34	16.69
29	Kantigadia	126	122	4	107	102	5	25	23	2	90	87	3	26.02	0.54	4.34	69.1	28.41
30	Sathipur	341	336	5	51	50	1	21	20	1	124	103	21	14.5	28.85	1.37	55.28	30.42
31	Balipasi	88	84	4	12	12	0	3	3	0	44	29	15	50.38	4.51	26.82	18.29	30.95
32	Manipur	82	78	4	28	21	7	2	2	0	44	41	3	34.06	42.03	4.35	19.56	31.26
33	Panikoili P.S	7365	6805	560	6429	5330	1099	596	513	83	7092	6171	921	24.73	13.98	0	61.29	32.85
34	Harichandpur	19	19	0	13	12	1	0	0	0	21	21	0	43.85	2.31	1.54	52.3	35.10
35	Mirjapur	170	100	70	187	184	3	3	3	0	217	103	114	36.2	18.75	0	45.05	27.62
36	Ambatola	18	18	0	48	48	0	0	0	0	12	12	0	21.18	41.18	7.06	30.58	24.53
37	Solapatta	146	145	1	114	106	8	6	6	0	31	27	4	44.67	19.82	0.89	34.62	30.94
38	Radhanagar	0	0	0	2	2	0	0	0	0	13	13	0	16.32	44.28	0.94	38.46	32.61
39	Thakurpatana	75	73	2	65	60	5	0	0	0	303	283	20	18.5	68	0	13.5	32.89
40	Santarapur	110	66	44	308	160	148	19	15	4	73	61	12	34.3	34.85	0.85	30	43.07
41	Talugan	47	47	0	120	110	10	0	0	0	37	35	2	18.14	53.98	5.86	22.02	32.08
42	Dhaneswar	240	230	10	8	6	2	6	4	2	40	33	7	27.66	63.83	0	8.51	21.29
43	Balia Pasi	38	38	0	7	6	1	4	4	0	57	49	8	25.83	65.68	0.37	8.12	35.45
44	Chakua	22	22	0	11	11	0	62	62	0	51	47	4	25.12	19.59	0	55.29	27.97
45	Marutikar	81	80	1	130	127	3	9	7	2	281	275	6	9.36	61.3	0.87	28.47	25.00
46	Damodarpur	2	1	1	6	5	1	0	0	0	4	3	1	29.53	57.21	0.23	13.03	28.57
47	Kumbhirigadia	115	114	1	68	61	7	5	4	1	311	298	13	47.17	33.02	4.72	15.09	29.99
48	Jakhapura P.S	744	733	11	825	683	142	167	151	16	3199	2917	282	53.92	27.45	3.92	14.71	28.32
49	Boulanga	40	39	1	61	59	2	56	55	1	150	136	14	30.22	52.75	0	17.03	26.98
50	Mangalpur	67	63	4	177	124	53	10	10	0	401	351	50	94.34	0	0	5.66	30.61
51	Telibedha	29	29	0	18	18	0	3	2	1	32	26	6	41.98	35.19	3.09	19.74	30.26
52	Nuagan	2	2	0	2	2	0	1	1	0	143	125	18	37.96	28.33	2.55	31.16	30.77
53	Ollala	165	165	0	76	68	8	4	3	1	49	44	5	0	0	33.33	66.67	27.40
54	Mulasar	112	110	2	182	170	12	1	0	1	40	37	3	53.42	34.93	0	11.65	33.74
55	Dankari	114	112	2	158	141	17	9	9	0	17	16	1	67.74	25.81	0	6.45	31.40
56	Kusunpur	18	18	0	89	81	8	3	3	0	39	27	12	14.12	82.06	0.38	3.44	36.52

57	Tikarapada	194	190	4	108	97	11	32	28	4	100	86	14	52.26	21.61	1.51	24.62	28.20
58	Nandakishore Pur	32	29	3	8	8	0	13	13	0	136	119	17	53.73	14.18	0	32.09	34.49
59	Ranipada	46	45	1	50	47	3	4	3	1	124	114	10	30.84	53.27	0	15.89	29.43
60	Dhuligarh	57	51	6	244	227	17	95	89	6	375	306	69	21.87	44.02	5.25	28.86	30.33
61	Dhabahali	38	32	6	73	31	42	0	0	0	27	19	8	95.45	0	0	4.55	43.81
62	Jhatiasahi	26	26	0	12	12	0	0	0	0	1	1	0	45.19	44.44	0.74	9.63	29.55
63	Jajpur Sadar P.S	9289	8967	322	13538	12572	966	1392	1082	310	14475	12525	1950	29.51	40.14	2.99	27.36	30.28
64	Janara	28	27	1	64	44	20	0	0	0	38	37	1	35.76	51.05	0.38	12.81	32.58
65	Jhumpan	31	29	2	51	50	1	5	5	0	23	19	4	61.79	24.29	5	8.92	28.87
66	Upulei	52	52	0	68	68	0	3	3	0	129	125	4	33.69	15.51	3.74	47.06	32.64
67	Sadakpur	34	32	2	153	147	6	7	7	0	294	282	12	9.88	53.09	13.93	23.1	27.14
68	Korai P.S	10850	9479	1371	11000	10185	815	967	829	159	7900	6500	1400	22.08	65.58	0.32	12.02	31.71
69	Santarapur	110	66	44	308	160	148	19	15	4	73	61	12	66.07	33.93	0	0	43.07
70	Panasua	16	16	0	6	6	0	1	1	0	6	6	0	17.7	61.97	0	20.33	18.71
71	Khamigan	217	216	1	67	57	10	0	0	0	39	33	6	18.52	64.2	13.58	3.7	32.56
72	Pataranga	273	267	6	624	296	328	0	0	0	23	18	5	36.84	33.33	1.75	28.08	53.80
73	Dhanapur	144	144	0	32	32	0	0	0	0	91	84	7	38.33	26.67	0	35	29.73
74	Korabandi	223	221	2	174	101	73	9	8	1	177	167	10	32.65	61.22	0	6.13	34.50
75	Ragada	222	201	21	321	200	121	5	4	1	359	270	89	37.97	31.59	0	30.44	41.61
76	Kantore	86	86	0	122	115	7	19	19	0	131	125	6	37.3	57.56	0	5.14	29.06
77	Mantira	174	161	13	10	4	6	5	3	2	49	40	9	44.9	42.86	0	12.24	34.80
78	Bhatasolapat	51	50	1	104	102	2	7	7	0	38	32	6	89.41	0	0	10.59	30.53
79	Janara	28	27	1	64	44	20	0	0	0	38	37	1	29.58	53.52	1.41	15.49	32.58
80	Mangobindapur	191	190	1	140	131	9	11	9	2	310	287	23	34.78	34.06	1.45	29.71	28.53
81	Kacheri Gan	10	10	0	15	13	2	1	1	0	189	135	54	23.04	59.8	0	17.16	30.45
82	Uparagarh	43	43	0	23	23	0	0	0	0	22	22	0	34.63	54.09	1.17	10.11	27.16
83	Kantia	63	55	8	267	256	11	2	2	0	137	122	15	42.94	46.33	3.39	7.34	23.22
84	Barakhai	58	56	2	138	126	12	2	2	0	71	64	7	76.99	17.48	0.61	4.92	28.05
85	Nadia Bhanga	140	137	3	60	52	8	10	9	1	455	388	67	53.45	44.83	0	1.72	29.17
86	Khandia Bandi	1	1	0	50	48	2	0	0	0	93	81	12	32.73	60	0	7.27	28.51
87	Madhapur	57	54	3	124	41	83	11	7	4	37	32	5	25.79	48.42	1.36	24.43	53.63
88	Sarangapur	156	132	24	119	70	49	15	12	3	310	269	41	1.94	98.06	0	0	34.38
89	Champa	23	23	0	65	65	0	3	2	1	12	8	4	81.08	0	0	18.92	26.41

90	Khurunti	8	6	2	30	19	11	2	0	2	771	582	189	27.36	24.5	0.78	47.36	41.02
91	Gobara Ghati	191	147	44	806	461	345	130	96	34	597	380	217	28.95	46.84	4.21	20	34.73
92	Chandia	75	70	5	249	104	145	4	4	0	114	83	31	12.5	79.17	0	8.33	34.03
93	Ankura Pal	69	62	7	119	93	26	1	1	0	35	25	10	59.09	12.5	1.14	27.27	23.55
94	Ramachandra pur	2	2	0	0	0	0	20	19	1	178	148	30	35.24	1.9	0.95	61.91	32.63
95	Nilamanidei Pursasan	22	22	0	9	9	0	4	4	0	190	183	7	56.78	16.95	0	26.27	31.16
96	Digambarpur	11	10	1	46	45	1	6	6	0	58	51	7	70.87	28.16	0.97	0	29.30
97	Sana Pingal	6	6	0	42	41	1	0	0	0	68	60	8	11.39	11.39	8.84	68.38	31.18
98	Bada Pingal	166	165	1	56	55	1	12	12	0	325	312	13	7.67	78.22	0.25	13.86	28.86
99	Nimapali	104	98	6	348	253	95	57	47	10	306	242	64	77.66	13.83	0	8.51	34.03
100	Golagan	108	97	11	157	147	10	12	11	1	92	77	15	44.44	55.56	0	0	25.66
101	Baghuapal	39	39	0	176	127	49	3	0	3	50	12	38	42.86	6.93	3.46	46.75	26.80
102	Bharada Pasi	49	42	7	31	19	12	1	1	0	56	32	24	0	93.33	6.67	0	35.77
103	Kantira	92	90	2	122	40	82	5	4	1	332	306	26	42.86	50	0	7.14	38.05
104	Atta	138	133	5	224	222	2	126	125	1	409	382	27	27.68	43.75	0.89	27.68	27.63
105	Bartanda	104	103	1	139	136	3	77	76	1	401	373	28	13.23	57.58	13.14	16.05	29.66
106	Bahabalpur	134	131	3	35	33	2	1	1	0	40	29	11	91.41	1.23	0	7.36	26.62
107	Haripur	271	267	4	397	391	6	59	54	5	297	263	34	15.63	41.15	13.02	30.2	27.89
108	Gahira Patuli	31	31	0	15	13	2	2	2	0	74	71	3	14.58	25.27	4.76	55.39	31.44
109	Hatibari	184	182	2	390	376	14	21	19	2	536	486	50	28.37	31.4	21.76	18.47	27.83
110	Karadapal	52	52	0	24	24	0	3	3	0	57	53	4	24.44	42.27	6.34	26.95	25.47
111	Bairimal	233	228	5	70	70	0	7	7	0	234	213	21	13.13	39.38	4.06	43.43	27.85
112	Bhalukipatala	71	66	5	239	72	167	3	3	0	146	136	10	4.3	15.05	12.9	67.75	39.13
113	Garamian	408	204	204	370	129	241	14	8	6	203	182	21	52.45	9.09	11.19	27.27	53.12
114	Kankadapal	67	67	0	84	41	43	1	1	0	218	170	48	51.22	48.78	0	0	35.51
115	Bambilo	167	163	4	95	70	25	6	6	0	325	305	20	33.64	48.6	9.35	8.41	28.01
116	Botalanda	81	79	2	179	175	4	1	1	0	401	370	31	16.82	60.45	0.91	21.82	28.40
117	Kuhika	159	85	74	237	66	171	1	1	0	244	222	22	2.08	93.75	0	4.17	47.48
118	Gandhapal	70	68	2	90	80	10	14	11	3	220	139	81	12.73	45.45	0	41.82	32.64
119	Mulakhamba	22	18	4	83	24	59	1	1	0	80	75	5	23.53	12.67	0.9	62.9	41.80
120	Nuadihi	65	64	1	36	16	20	7	4	3	104	101	3	27.96	40.86	0	31.18	31.59
121	Manatira	53	53	0	123	110	13	21	19	2	467	437	30	1.31	93.89	0.44	4.36	24.84
122	Barabati	96	96	0	2	2	0	16	11	5	255	205	50	49.62	41.35	0	9.03	29.85

123	Mangalpur	95	62	2	189	129	60	9	9	0	362	324	38	23.11	20.83	5.3	50.76	30.61
124	Uchabali	201	196	5	18	16	2	107	107	0	73	59	14	6.74	65.17	0	28.09	27.80
125	Badabil	47	47	0	58	57	1	6	6	0	27	27	0	16.91	81.29	0	1.8	28.81
126	Kumbhanagara	23	23	0	13	13	0	0	0	0	57	53	4	33.64	41.82	13.64	10.9	27.76
127	Gouda Bahali	57	56	1	3	3	0	2	2	0	68	59	9	82.42	13.33	1.21	3.04	32.18
128	Ragadi	139	118	21	72	56	16	0	0	0	173	157	16	1.19	11.9	0	86.91	29.45
129	Tura	18	18	0	35	34	1	6	4	2	26	24	2	10.48	59.39	0.44	29.69	31.95
130	Tarailo	151	150	1	67	58	9	3	3	0	117	109	8	22.31	59.5	10.74	7.45	31.09
131	Nachhipura	87	86	1	236	227	9	5	4	1	205	197	8	32.04	26.21	0	41.75	28.13
132	Kharadabandi	37	37	0	136	135	1	0	0	0	27	26	1	42.86	57.14	0	0	28.41
133	Chitri	438	427	11	453	254	199	11	9	2	398	351	47	9.43	6.6	5.66	78.31	34.58
134	Salijanga	164	160	4	488	433	55	53	9	44	199	174	25	15.47	52.07	0.65	31.81	29.52
135	Godarapal	26	26	0	60	59	1	0	0	0	8	6	2	64.49	24.08	1.22	10.21	26.93
136	Routpada	70	70	0	178	176	2	1	1	0	22	21	1	18.18	13.64	0	68.18	27.60
137	Andhari	159	155	4	124	68	56	0	0	0	350	146	204	88.46	7.69	0	3.85	63.81
138	Kadama	75	75	0	491	394	97	7	6	1	228	203	25	41.94	33.89	0.95	23.22	36.23
139	Kiapada	127	124	3	246	215	31	1	1	0	56	47	9	26.71	4.35	13.66	55.28	29.86
140	Gopalpur	50	50	0	35	35	0	5	5	0	16	15	1	24.62	64.62	0	10.76	23.87
141	Raghupur	55	55	0	28	28	0	4	4	0	15	15	0	88.41	4.35	0	7.24	27.20
142	Ramakrishnapur	55	52	3	96	95	1	0	0	0	31	27	4	29.17	46.88	1.74	22.21	28.13
143	Belada	50	47	3	0	0	0	0	0	0	3	2	1	9.94	19.89	0	70.17	20.00
144	Mahulia	68	67	1	57	53	4	5	5	0	32	24	8	27.18	47.57	0.49	24.76	28.57
145	Paramanandapur	134	132	2	100	95	5	9	3	6	110	104	6	48.05	23.38	0	28.57	28.33
146	Aranto	0	0	0	0	0	0	1	1	0	2	1	1	32.77	17.23	2.36	47.64	30.00
147	Patarakana	78	77	1	51	49	2	0	0	0	17	15	2	40	13.33	20	26.67	26.45
148	Sampur	21	21	0	8	8	0	0	0	0	2	1	1	68.29	17.07	0	14.64	31.96
149	Sanla	37	35	2	215	208	7	1	0	1	9	5	4	19.21	44.91	0.69	35.19	28.92
150	Kacharasahi	208	203	5	86	77	9	6	6	0	98	93	5	86.84	10.53	0	2.63	29.01
151	Bachhipur	72	72	0	19	19	0	0	0	0	43	40	3	76.47	2.35	0	21.18	27.46
152	Sitalgobindpur	33	30	3	57	52	5	0	0	0	17	13	4	18.11	22.7	0.27	58.92	28.53
153	Pachhikote	75	75	0	151	150	1	18	8	10	99	92	7	44.83	17.24	0	37.93	29.65
154	Sunachara	42	42	0	0	0	0	0	0	0	2	2	0	4.53	43.21	1.65	50.61	28.39
155	Nayahatpatna	61	60	1	60	57	3	1	1	0	13	10	3	55.4	12.23	0	32.37	31.18

156	Mukundapur	286	283	3	389	331	58	29	22	7	265	248	17	91.18	7.35	0	1.47	32.58
157	Ranagundi	187	177	10	267	169	98	2	2	0	67	54	13	24.43	27.7	4.35	43.52	33.44
158	Tulasipur	173	171	2	68	51	17	14	14	0	25	20	5	22.75	50.6	4.79	21.86	29.98
159	Gourpur	63	62	1	29	15	14	7	5	2	88	81	7	35.48	35.48	0	29.04	30.46
160	Baliapal	112	91	21	602	265	337	158	68	90	262	175	87	9.48	17.2	10.94	62.38	49.45
161	Sulia	68	61	7	202	189	13	1	1	0	37	30	7	13.29	43.35	6.94	36.42	24.98
162	Sahaspur	37	37	0	19	19	0	0	0	0	0	0	0	23.68	21.05	2.63	52.64	27.86
163	Purbakote	54	51	3	189	181	8	0	0	0	62	59	3	8.33	44.79	1.04	45.84	28.80
164	Khosalpur	15	14	1	52	50	2	11	10	1	3	3	0	10.47	54.05	4.22	31.26	30.92
165	Narendrabhog	21	21	0	19	19	0	1	1	0	16	14	2	50.76	37.76	0.6	10.88	26.03
166	Manjuri	23	23	0	16	14	2	0	0	0	21	20	1	7.14	85.71	3.57	3.58	52.79
167	Talia	16	16	0	30	29	1	0	0	0	3	3	0	19.97	23.09	2.98	53.96	32.67
168	Gohiragadia	131	129	2	109	105	4	0	0	0	105	94	11	48.32	16.78	0.67	34.23	29.24
169	Asanagadia	116	104	12	179	41	138	0	0	0	16	11	5	45.9	22.95	4.1	27.05	61.46
170	Gayalgadia	22	20	2	21	17	4	0	0	0	6	6	0	18.68	35.16	0	46.16	36.03
171	Biridiha	76	74	2	0	0	0	0	0	0	9	8	1	13.16	22.4	13.95	50.49	21.85
172	Barahampur	42	38	4	76	72	4	2	2	0	22	17	5	24.04	44.51	6.23	25.22	30.41
173	Solapatia	48	46	2	47	42	5	2	2	0	41	36	5	77.78	0	1.85	20.37	33.58
174	Gamharia	47	45	2	122	116	6	0	0	0	35	32	3	46.35	29.2	0.73	23.72	27.83
175	Oshala	89	88	1	139	137	2	3	3	0	26	22	4	0	82.04	1.46	16.5	24.13
176	Rampilo	152	149	3	164	155	9	12	12	0	26	20	6	21.97	31.31	0.25	46.47	29.57
177	Godigotha	251	232	19	57	54	3	2	2	0	16	11	5	41.05	24.21	0	34.74	28.47
178	Bainsipur	31	30	1	26	25	1	0	0	0	1	1	0	30	57.92	0	12.08	35.58
179	Jaintira	18	18	0	33	31	2	0	0	0	4	4	0	28.07	48.73	8.97	14.23	34.59
180	Aranyamadana	57	57	0	107	66	41	3	3	0	54	34	20	11.76	79.41	2.94	5.89	48.04
181	Mandapada	2	2	0	101	54	47	0	0	0	0	0	0	45.53	23.86	10.54	20.07	46.19
182	Jalapatipur	30	28	2	0	0	0	0	0	0	7	5	2	34.15	60.98	0	4.88	26.24
183	Pimpudia	316	278	38	283	75	208	9	9	0	547	342	205	18.3	71.43	3.76	6.51	46.93
184	Sahagan	55	52	3	89	77	12	8	8	0	38	33	5	34	6	0	60	32.42
185	Uttarkota	6	6	0	38	32	6	0	0	0	4	3	1	20.67	56.33	4.67	18.33	30.00
186	Biruanpada	52	50	2	11	9	2	1	1	0	24	17	7	17.62	7.2	1.18	74	31.88
187	Mangarajpur	37	37	0	2	2	0	1	1	0	65	64	1	64.34	26.57	2.1	6.99	30.43
188	Uttarakhajira	67	66	1	20	20	0	0	0	0	31	28	3	10.19	14.08	2.91	72.82	28.23

189	Kantapal	73	71	2	29	18	11	1	1	0	0	0	0	14.95	64.95	1.09	19.01	33.44
190	Baragadia	67	59	8	67	62	5	52	50	2	402	365	37	10.74	9.51	0	79.75	25.31
191	Ambapal	31	26	5	316	151	165	1	1	0	56	44	12	0	92.56	0	7.44	49.27
192	Nigodha	73	73	0	13	11	2	0	0	0	8	8	0	37	1	2	60	24.48
193	Chhanchania	12	12	0	15	14	1	0	0	0	0	0	0	12.57	38.5	2.41	46.52	42.86
194	Sansailo	396	294	102	64	37	27	32	26	6	432	398	34	58.76	33.33	0.56	7.35	31.83
195	Gorakhapur	0	0	0	28	28	0	2	2	0	0	0	0	21.37	37.02	1.61	40	29.70
196	Pandiapada	6	6	0	7	6	1	0	0	0	1	1	0	69.7	27.27	0	3.03	35.90
197	Khaira	31	29	2	49	38	11	1	1	0	31	30	1	19.44	67.59	0	12.97	32.84
198	Bandalo	150	146	4	653	464	189	149	139	10	182	160	22	13.31	18.09	0	68.6	33.39
199	Jagulaigadia	149	148	1	2	2	0	0	0	0	12	10	2	70.94	6.04	2.26	20.76	26.08
200	Kankadajhar	30	30	0	79	78	1	25	12	13	58	55	3	37.65	1.85	0.62	59.88	33.63
201	Duburi	199	193	6	345	290	55	65	51	14	756	688	68	35.42	13.89	7.64	43.05	31.90
202	Santasahi	103	102	1	114	112	2	79	79	0	67	64	3	45.38	30.25	0	24.37	27.86
203	Bandhagan	185	160	25	320	111	209	48	36	12	204	152	52	16.14	5.73	2.55	75.58	39.26
204	Kaduabandi	55	54	1	165	49	116	17	10	7	182	165	17	25.42	20.34	0.42	53.82	42.11
205	Saransa	4	3	1	14	12	2	12	12	0	63	61	2	29.07	23.03	12.08	35.82	35.09
206	Khajurinalua	225	113	112	39	32	7	48	12	36	117	64	53	3.45	81.03	1.72	13.8	79.74
207	Gobaragali	21	20	1	20	19	1	0	0	0	0	0	0	24.74	26.28	1.03	47.95	37.61
208	Gopinathpur	36	36	0	52	49	3	10	10	0	9	8	1	16.67	24.24	0.76	58.33	28.38
209	Jemadeipur	37	33	4	133	29	104	2	2	0	48	41	7	18.18	27.27	16.73	37.82	43.22
210	Khajuribindha	1	0	1	45	22	23	0	0	0	2	2	0	41.67	25	0	33.33	85.71
211	Kaliapal	14	14	0	50	50	0	0	0	0	46	43	3	15.74	51.39	2.31	30.56	28.95
212	Galiachhanda	52	52	0	28	17	11	2	0	2	139	125	14	15.67	43.45	2.94	37.94	36.11
213	Raghunathpur	26	25	1	38	11	27	0	0	0	29	27	2	15.18	17.62	8.4	58.8	41.33
214	Arjunjhar	3	1	2	215	108	107	1	1	0	10	7	3	30.47	57.03	2.34	10.16	53.38
215	Sundarapokhari	66	64	2	55	53	2	0	0	0	12	11	1	11.94	6.94	0.56	80.56	35.19
216	Rahemanpur	61	61	0	55	47	8	14	14	0	134	114	20	24.36	6.84	0.85	67.95	31.10
217	Akhanpur	6	6	0	58	58	0	0	0	0	25	25	0	65.45	18.18	1.82	14.55	32.36
218	Baragaji	47	46	1	226	107	119	0	0	0	5	3	2	53.24	12.23	4.32	30.21	46.49
219	Routapada	37	36	1	46	44	2	15	15	0	12	12	0	40.4	43.7	3	12.9	26.76
220	Kantipur	136	136	0	22	20	2	2	2	0	5	3	2	52.24	11.94	0	35.82	25.42
221	Kusumundia	1	1	0	10	7	3	0	0	0	73	65	8	52.05	40.35	0	7.6	12.86

222	Gantayatkateni	24	22	2	136	39	97	1	1	0	68	61	7	39.53	13.04	13.44	33.99	49.67
223	Ashokjhar	54	53	1	144	118	26	26	26	0	18	13	5	45.81	8.1	3.09	43	33.66
224	Dhapanki	33	33	0	27	27	0	0	0	0	43	41	2	26.15	61.54	1.54	10.77	26.41
225	Kankadagadia	3	3	0	4	4	0	0	0	0	0	0	0	17.88	69.83	0.56	11.73	38.89
226	Krishnapur Sasan	10	10	0	7	7	0	6	6	0	83	76	7	67.52	20.09	1.71	10.68	27.18
227	Bhalukipatala	71	66	5	239	72	167	3	3	0	146	136	10	15.69	12.96	10.95	60.4	39.13
228	Mohammadhosenpur	158	100	58	59	23	36	3	3	0	25	20	5	4.71	11.76	2.75	80.78	47.30
229	Itapur	4	4	0	3	3	0	0	0	0	15	15	0	17.32	20	1.79	60.89	31.88
230	Bagira	46	46	0	4	3	1	0	0	0	2	2	0	7.05	78.47	0.59	13.89	29.55
231	Dudhajori	177	170	7	143	64	79	4	4	0	98	93	5	3.21	28.88	19.79	48.12	39.26
232	Naguan	43	43	0	7	6	1	22	22	0	89	79	10	18.52	9.26	0	72.22	28.45
233	Padi	16	16	0	42	42	0	0	0	0	7	7	0	27.9	28.62	1.99	41.49	22.49
234	Tarapada	61	61	0	3	3	0	0	0	0	5	4	1	57.8	38.15	0	4.05	20.47
235	Taharpur	84	83	1	135	119	16	5	3	2	64	43	21	35.85	6.6	3.77	53.78	27.35
236	Nayagarh	18	15	3	36	21	15	0	0	0	127	111	16	9.26	55.56	5.56	29.62	37.87
237	Sarasada	56	56	0	98	98	0	1	1	0	51	40	11	7.3	11.39	5.66	75.65	28.03
238	Salakana	37	37	0	18	18	0	0	0	0	22	19	3	28.95	27.89	1.84	41.32	23.91
239	Barighodha	97	96	1	51	47	4	7	6	1	141	134	7	28.03	26.75	1.91	43.31	28.24
240	Hatimunda	6	5	1	2	1	1	3	3	0	4	4	0	25.81	38.21	0	35.98	30.00
241	Kandaragadia	28	28	0	7	6	1	0	0	0	6	6	0	6.25	44.64	1.79	47.32	28.87
242	Olia	83	68	15	194	112	82	3	3	0	152	127	25	12.87	24.26	0	62.87	37.47
243	Banahara	33	19	14	4	2	2	0	0	0	1	1	0	16.59	6.16	3.32	73.93	50.67
244	Sainto	65	64	1	2	2	0	0	0	0	18	18	0	41.08	25.09	4.65	29.18	26.81
245	Kankadapal	67	67	0	84	41	43	1	1	0	218	170	48	9.65	9.65	3.51	77.19	35.51
246	Sisua	13	12	1	5	3	2	0	0	0	11	10	1	18.33	65	5	11.67	28.16
247	Abhayapur	11	11	0	105	101	4	4	4	0	123	117	6	6.31	19.44	24.25	50	26.53
248	Mulasaragada	77	74	3	17	17	0	0	0	0	45	42	3	25	0	0	75	28.72
249	Bantala	62	61	1	5	5	0	0	0	0	1	1	0	21.22	31.29	9	38.49	20.86
250	Fazalpur	247	243	4	280	249	31	44	20	24	440	367	73	58.79	38.46	0	2.75	32.85
251	Rangaranga	76	72	4	169	110	59	16	10	6	73	65	8	5.56	94.44	0	0	34.68
252	Khilipankha	55	55	0	55	52	3	0	0	0	45	44	1	12.14	25.36	5	57.5	28.49
253	Nizigarh	188	151	37	341	230	111	217	200	17	1237	1050	187	42.59	7.41	1.85	48.15	31.63
254	Kuanrada	23	23	0	75	70	5	12	12	0	63	60	3	57.63	42.37	0	0	31.06

255	Gadapur	9	0	9	8	2	6	1	1	0	20	12	8	50.76	10.23	0.37	38.64	10.38
256	Brahmanda	8	8	0	43	42	1	1	1	0	44	39	5	23.45	26.55	0.52	49.48	30.77
257	Sukaran	62	55	7	320	165	155	25	18	7	185	159	26	39.46	29.19	0	31.35	39.47
258	Aladajalasarpur	168	167	1	125	96	29	2	2	0	36	31	5	10.31	53.61	3.09	32.99	28.05
259	Barapal	8	8	0	96	54	42	4	4	0	4	3	1	30.95	55.95	0	13.1	39.44
260	Damodar pur	154	137	17	178	124	54	23	20	3	416	338	78	4.37	32.52	2.92	60.19	32.70
261	Palasa	72	72	0	25	22	3	1	1	0	51	46	5	40.79	32.89	0	26.32	30.85
262	Ranasarapur	56	55	1	28	28	0	5	5	0	33	31	2	41.15	20.35	0.23	38.27	25.52
263	Baladia	17	17	0	32	31	1	0	0	0	42	41	1	32.73	21.98	1.81	43.48	28.62
264	Jamupasi	67	56	11	114	90	24	71	67	4	257	200	57	16.8	26.8	2.8	53.6	32.52
265	Bhakandari	81	78	3	150	138	12	21	16	5	85	76	9	51.76	29.42	0	18.82	32.91
266	Baghanata	42	42	0	0	0	0	1	1	0	11	11	0	31.25	50	0	18.75	30.51
267	Kanchichua	127	62	65	80	41	39	2	2	0	65	52	13	43.99	27.68	0.43	27.9	44.05
268	Kharajabatira	0	0	0	169	162	7	3	3	0	34	32	2	86.24	11.01	0	2.75	26.79
269	Mangal Pur	87	85	2	124	118	6	1	1	0	184	180	4	23.16	51.47	0	25.37	27.40
270	Adhagan	39	39	0	23	23	0	0	0	0	33	32	1	45.34	31.68	0.62	22.36	28.88
271	Bartamana	72	71	1	139	130	9	0	0	0	29	28	1	29	36.5	2.5	32	30.97
272	Mrutunjayapur	144	142	2	250	235	15	46	44	2	73	60	13	28.67	43.36	6.29	21.68	30.65
273	Depada	4	4	0	27	27	0	1	1	0	2	2	0	12.87	24.26	0	62.87	29.57
274	Ranigoda	229	226	3	120	115	5	53	51	2	101	78	23	61.36	25	0	13.64	32.06
275	Gobindapur	112	108	4	200	112	88	0	0	0	16	11	5	26.05	42.79	0.93	30.23	47.13
276	Mirigi Chara	73	73	0	285	137	148	15	15	0	26	20	6	43.53	49.41	0	7.06	40.84
277	Sata Bainsia	17	17	0	3	3	0	0	0	0	30	29	1	33.33	37.04	16.67	12.96	21.28
278	Pubal	62	54	8	169	114	55	14	13	1	55	47	8	25.13	40.7	1.51	32.66	34.97
279	Jakha Pura	225	218	7	92	82	10	15	14	1	945	864	81	26.27	37.29	8.47	27.97	30.76
280	Ochinda	92	90	2	38	38	0	3	3	0	10	6	4	42.23	45.82	1.99	9.96	28.49
281	Ampolaba	42	37	5	58	43	15	12	6	6	300	279	21	1	0	10	89	32.75
282	Ranapal	55	54	1	239	155	84	4	2	2	70	64	6	9.78	4	1.78	84.44	38.10
283	Khaira dihi	35	35	0	31	30	1	0	0	0	260	249	11	9.09	38.02	4.96	47.93	30.24
284	Begana	0	0	0	112	112	0	0	0	0	9	8	1	5.17	36.21	0	58.62	29.09
285	Chillipada	74	67	7	2	0	2	4	3	1	120	39	81	29.7	10.02	2.15	58.13	60.98
286	Gunduchi pasi	47	45	2	144	42	102	9	2	7	174	148	26	12.76	42.7	6.99	37.55	39.83
287	Mulari	104	102	2	59	38	21	1	0	1	13	11	2	29.27	42.55	3.25	24.93	34.30

288	Karada	172	161	11	298	266	32	13	9	4	322	292	30	14.55	65.67	1.12	18.66	30.37
289	Khosalapur	23	20	3	9	9	0	0	0	0	1	1	0	35.77	22.63	0.72	40.88	32.35
290	Barapada	21	20	1	73	64	9	0	0	0	14	13	1	16.7	22.14	0.91	60.25	29.35
291	Balunga Bandi	39	39	0	53	50	3	0	0	0	201	191	10	15.38	24.97	14.05	45.6	29.15
292	Taja Pur	188	145	43	16	5	11	6	2	4	55	26	29	14.42	19.28	10.68	55.62	42.60
293	Benapur	61	53	8	3	2	1	1	1	0	97	31	66	63.81	16.67	0.47	19.05	60.22
294	Khasa Gadia	51	48	3	20	17	3	11	10	1	62	46	16	26.46	38.77	5.77	29	33.10
295	Brajanagar	108	106	2	72	72	0	0	0	0	58	47	11	25.41	12.3	1.64	60.65	34.49
296	Kharadi	76	67	9	27	13	14	12	11	1	356	294	62	16.27	34.48	1.86	47.39	30.62
297	Bada barunei pada	60	60	0	48	33	15	1	1	0	127	102	25	38.24	17.65	2.21	41.9	38.06
298	Janha	207	195	12	164	130	34	86	81	5	255	236	19	42.83	12.87	1.29	43.01	32.53
299	Ghikoili	2	2	0	47	46	1	1	1	0	8	7	1	15.47	52.07	0.65	31.81	30.37
300	Pathara Pada	193	164	29	205	138	67	8	5	3	374	290	84	41.01	37.19	1.5	20.3	37.37
301	Taluri	22	18	4	32	27	5	1	1	0	77	62	15	18.11	22.7	0.27	58.92	35.48
302	Dasamania	50	49	1	75	73	2	46	41	5	104	99	5	28.16	16.02	1.01	54.81	25.92
303	Pancha Batia	5	4	1	3	3	0	0	0	0	4	4	0	12.24	27.04	0.15	60.57	23.53
304	Badasulidiha	68	68	0	222	145	77	10	8	2	132	113	19	24.8	36.97	0.16	38.07	27.78
305	Rachhi Pur	128	121	7	355	288	67	24	23	1	310	279	31	17.77	22.84	3.55	55.84	31.74
306	Chhotara Pur	56	55	1	65	65	0	31	28	3	217	205	12	11.83	44.62	0.54	43.01	32.80
307	Nuapada	39	39	0	73	73	0	3	2	1	13	12	1	30.66	16.98	3.3	49.06	31.07
308	Ambasara	43	40	3	25	17	8	2	2	0	290	231	59	7.98	18.52	3.16	70.34	29.95
309	Rudhia	57	57	0	16	14	2	2	2	0	159	145	14	26.02	0.54	4.34	69.1	26.80
310	Oupada	36	35	1	10	9	1	1	1	0	8	5	3	14.5	28.85	1.37	55.28	28.95
311	Janha Kana	74	74	0	17	16	1	6	6	0	42	37	5	50.38	4.51	26.82	18.29	24.87
312	Tailada	13	13	0	14	5	9	1	0	1	4	1	3	34.06	42.03	4.35	19.56	39.02
313	Bajarapada	35	35	0	8	8	0	0	0	0	24	23	1	24.73	13.98	0	61.29	28.39
314	Mohammed Jamalpur	89	85	4	69	63	6	0	0	0	13	11	2	43.85	2.31	1.54	52.3	28.45
315	Raitikar	100	99	1	33	33	0	34	33	1	86	76	10	36.2	18.75	0	45.05	29.38
316	Alatiri	475	296	179	84	65	19	32	31	1	446	398	48	21.18	41.18	7.06	30.58	37.12
317	Khaira Bad	17	16	1	40	40	0	1	1	0	7	6	1	44.67	19.82	0.89	34.62	29.15
318	Nara Pada	64	57	7	250	129	121	2	2	0	42	27	15	16.32	44.28	0.94	38.46	55.50
319	Kuru Pada	316	164	152	94	41	53	8	5	3	50	43	7	18.5	68	0	13.5	67.05
320	Rabana	86	86	0	71	58	13	60	56	4	331	291	40	34.3	34.85	0.85	30	27.16

321	Bhiki Pur	12	10	2	30	29	1	7	6	1	206	188	18	18.14	53.98	5.86	22.02	35.52
322	Manohar Pur	97	95	2	112	95	17	10	8	2	341	327	14	27.66	63.83	0	8.51	30.24
323	Dania Bar	36	35	1	401	392	9	3	2	1	71	68	3	25.83	65.68	0.37	8.12	30.04
324	Badhei Tikar	6	5	1	54	46	8	37	22	15	90	70	20	25.12	19.59	0	55.29	37.63
325	Hetagadia	10	10	0	5	5	0	0	0	0	39	37	2	9.36	61.3	0.87	28.47	30.34
326	Soti	154	153	1	158	149	9	11	11	0	229	216	13	29.53	57.21	0.23	13.03	30.89
327	Namatikiri	100	99	1	66	65	1	0	0	0	7	5	2	47.17	33.02	4.72	15.09	30.95
328	Balia Pasi	38	38	0	7	6	1	4	4	0	57	49	8	53.92	27.45	3.92	14.71	35.45
329	Brahman Bad	5	5	0	30	30	0	3	3	0	16	15	1	30.22	52.75	0	17.03	25.59
330	Khaman	89	85	4	139	123	16	69	52	17	923	863	60	94.34	0	0	5.66	30.92
331	Pahanga	220	220	0	212	179	33	14	12	2	314	287	27	41.98	35.19	3.09	19.74	29.31
332	Nahanda	44	44	0	42	40	2	3	3	0	68	64	4	37.96	28.33	2.55	31.16	33.05
333	Matabad	104	104	0	154	150	4	0	0	0	145	138	7	0	0	33.33	66.67	30.62
334	Sendhapur	14	11	3	100	50	50	4	2	2	106	84	22	53.42	34.93	0	11.65	46.00
335	Chhatra Kana	26	24	2	49	12	37	0	0	0	127	118	9	67.74	25.81	0	6.45	36.40
336	Krushnnagar	35	35	0	13	13	0	7	7	0	156	142	14	14.12	82.06	0.38	3.44	32.07
337	Kaitha	221	220	1	135	135	0	25	25	0	157	145	12	52.26	21.61	1.51	24.62	27.77
338	Krushnanagar Patna	11	11	0	11	9	2	4	4	0	88	84	4	53.73	14.18	0	32.09	29.77
339	Gobinda Pur	11	11	0	39	35	4	3	1	2	7	6	1	30.84	53.27	0	15.89	35.29
340	Laxmi Nagar	50	39	11	154	139	15	196	185	11	392	345	47	21.87	44.02	5.25	28.86	30.61
341	Gotutha	1	1	0	0	0	0	0	0	0	3	3	0	95.45	0	0	4.55	33.33
342	Tara Pur	59	57	2	87	83	4	25	17	8	107	89	18	45.19	44.44	0.74	9.63	30.89
343	Sala Pada	107	106	1	70	65	5	0	0	0	5	4	1	29.51	40.14	2.99	27.36	32.91
344	Balarampur	1	1	0	17	11	6	0	0	0	0	0	0	35.76	51.05	0.38	12.81	33.33
345	Naudapur	34	33	1	71	69	2	14	13	1	161	148	13	61.79	24.29	5	8.92	33.73
346	Brahmangan	23	23	0	4	4	0	1	1	0	26	24	2	33.69	15.51	3.74	47.06	29.35
347	Khajuri Pur	34	34	0	25	25	0	0	0	0	0	0	0	9.88	53.09	13.93	23.1	36.88
348	Jokadia	134	134	0	27	27	0	1	1	0	102	94	8	22.08	65.58	0.32	12.02	33.29
349	Khapuria Pada	91	89	2	103	100	3	2	2	0	192	180	12	66.07	33.93	0	0	28.98
350	Rampur Sagadi	73	72	1	54	53	1	0	0	0	58	57	1	17.7	61.97	0	20.33	29.89
351	Serapur	10	10	0	52	52	0	3	3	0	32	24	8	18.52	64.2	13.58	3.7	27.17
352	Nuapatna	26	26	0	47	47	0	0	0	0	11	8	3	36.84	33.33	1.75	28.08	29.79
353	Jalaka	9	9	0	67	65	2	6	2	4	124	118	6	38.33	26.67	0	35	26.89

354	Khandara Pur	31	30	1	25	22	3	0	0	0	20	18	2	32.65	61.22	0	6.13	35.02
355	Goleipur	186	184	2	92	74	18	1	1	0	173	164	9	37.97	31.59	0	30.44	31.83
356	Badabiruan	271	264	7	182	143	39	15	13	2	360	299	61	37.3	57.56	0	5.14	33.32
357	Godipatana	42	40	2	67	62	5	7	6	1	134	121	13	44.9	42.86	0	12.24	32.13
358	Benga madha Pur	44	44	0	25	25	0	0	0	0	16	13	3	89.41	0	0	10.59	26.40
359	Salapari	10	10	0	16	10	6	0	0	0	6	6	0	29.58	53.52	1.41	15.49	36.78
360	Rautra Pur	205	205	0	129	115	14	2	2	0	130	118	12	34.78	34.06	1.45	29.71	33.41
361	Telia	94	92	2	12	12	0	0	0	0	3	3	0	23.04	59.8	0	17.16	30.88
362	Sana Biruan	63	59	4	140	136	4	0	0	0	69	63	6	34.63	54.09	1.17	10.11	32.65
363	Mangaraj Pur	73	73	0	51	51	0	1	1	0	36	31	5	42.94	46.33	3.39	7.34	35.86
364	Banamali Pur	58	56	2	73	72	1	5	5	0	64	52	12	76.99	17.48	0.61	4.92	32.63
365	Banja	82	82	0	124	123	1	18	18	0	62	53	9	53.45	44.83	0	1.72	30.17
366	Chhatra Kana	26	24	2	49	12	37	0	0	0	127	118	9	32.73	60	0	7.27	36.40
367	Kumudisasan	27	27	0	11	11	0	0	0	0	6	5	1	25.79	48.42	1.36	24.43	22.11
368	Talagarh	168	158	10	276	265	11	6	6	0	195	180	15	1.94	98.06	0	0	30.63
369	Hatapur	37	37	0	42	42	0	0	0	0	6	5	1	81.08	0	0	18.92	26.48
370	radha nagar	18	72	1	20	14	6	9	9	0	7	10	0	27.36	24.5	0.78	47.36	64.29
371	Solapur	200	170	30	324	300	24	12	12	0	260	259	1	28.95	46.84	4.21	20	56.90
372	Charada	31	20	11	44	24	20	10	9	1	33	27	6	12.5	79.17	0	8.33	25.88
373	Dhantiri	106	103	3	115	112	3	5	5	0	25	25	0	59.09	12.5	1.14	27.27	29.29

In KEONJHAR District

Sl. no.	Village Name	Total people	Main and Marginal												Percentage				
			Cultivators			Agricultural			Household Industries			Other workers							
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Cultivators	Agricultural	Household Industries	Other workers	Work Participation Rate
1	Indupura	530	89	88	1	14	13	1	1	1	0	28	26	2	67.42	10.61	0.76	21.21	24.91
2	Jenapada	474	50	46	4	103	100	3	6	6	0	6	4	2	28.57	64.57	3.43	3.43	36.92
3	Nandabar	1250	287	285	2	53	47	6	7	7	0	51	42	9	63.50	23.67	1.55	11.28	36.16
4	Baranga	1491	255	250	5	126	110	16	3	3	0	28	21	7	53.01	40.54	0.62	5.82	32.26
5	Beguniadihi	542	85	85	0	7	7	0	0	0	0	11	9	2	82.52	6.80	0	10.68	19.00
6	Tukuna	1426	25	25	0	213	200	13	3	1	2	142	130	12	6.20	57.82	0.74	35.24	28.26
7	Banika	879	88	80	8	105	104	1	1	1	0	43	39	4	36.51	45.23	0.41	17.84	27.42
8	Hatibandha	820	121	117	4	38	29	9	9	9	0	100	86	14	45.15	14.18	3.36	37.31	32.68
9	Madanpur	2536	250	245	5	260	235	25	34	33	1	214	198	16	31.53	37.20	4.29	26.99	31.27
10	Hasanpur	558	58	58	0	2	2	0	0	0	0	93	86	7	37.42	2.58	0	60	27.78
11	Nayagarh	1269	200	150	50	22	3	19	100	100	0	342	300	42	25.94	16.73	12.97	44.36	60.76
12	Rudranarayanpur	580	42	42	0	72	71	1	1	1	0	26	21	5	29.17	52.08	0.69	18.06	24.83
13	Machhalo	2000	398	393	5	121	100	21	1	1	0	39	35	4	68.62	24.48	0.17	6.72	29.00
14	Pandua	615	155	152	3	159	142	17	7	7	0	60	56	4	45.99	34.12	2.08	17.80	54.80
15	Karadapal	1568	240	200	40	98	32	66	69	68	1	360	332	28	30.81	14.12	8.86	46.21	49.68
16	Bato	1744	92	90	2	273	270	3	3	2	1	159	143	16	17.23	52.43	0.56	29.78	30.62
17	Tampo	229	12	12	0	34	34	0	0	0	0	15	11	4	19.67	55.74	0	24.59	26.64
18	Sainkul P.S	7869	9756	9535	221	6073	5173	900	426	393	33	6483	5595	888	41.07	29.85	1.79	27.29	30.19
19	Kolhabarapada	1729	76	68	8	11	11	0	5	3	2	479	354	125	11.14	17.89	0.73	70.23	39.44
20	Paramanandapur	97	4	4	0	22	16	6	0	0	0	0	0	0	9.52	90.48	0	0	43.30
21	Khalana	3158	615	595	20	210	180	30	6	6	0	140	116	24	58.57	27.52	0.57	13.33	33.25
22	Dantia	1026	154	151	3	63	59	4	0	0	0	69	56	13	50.66	26.64	0	22.70	29.63

23	Lunahar	607	115	114	1	10	2	8	7	7	0	40	37	3	66.47	6.36	4.05	23.12	28.50
24	Patasura	585	126	122	4	69	62	7	0	0	0	12	12	0	60.29	33.97	0	5.74	35.73
25	Taruan	1383	184	184	0	137	110	27	0	0	0	34	26	8	50.97	39.61	0	9.42	26.10
26	Brahmanapanga	601	37	35	2	132	98	34	2	2	0	6	4	2	10.28	87.5	0.56	1.67	59.90
27	Kendukhunta	626	121	116	5	7	5	2	2	2	0	39	32	7	71.60	4.14	1.18	23.08	27.00
28	Ramachandrapur	919	151	151	0	35	9	26	1	1	0	37	28	9	64.81	18.88	0.43	15.88	25.35
29	Baranga	1613	66	63	3	133	122	11	0	0	0	38	17	21	27.39	56.85	0	15.77	14.94
30	Angarua	351	125	124	1	132	110	22	3	3	0	143	130	13	30.79	33.25	0.74	35.22	50.6.
31	Mathianendi	342	30	29	1	83	80	3	0	0	0	6	3	3	24	71.2	0	4.8	36.5
32	Tigiria	2300	45	35	10	49	45	4	0	0	0	77	7	2	25.86	29.89	0	44.25	17.57
33	Alati	874	224	220	4	190	160	30	43	43	0	163	148	15	35.96	30.98	6.90	26.16	71. 8
34	Raitola	460	76	75	1	78	70	18	17	16	1	132	119	13	25	25.99	5.59	43.42	56.3
35	Krushnapur	1127	75	70	5	36	35	1	1	1	0	21	21	0	39.68	48.68	0.53	11.11	23.17
36	Ghasipura P.S	1319	12591	11981	610	10653	5234	5419	1446	1003	443	8458	7066	1392	32.80	41.39	3.77	22.04	29.93
37	Purunian	1185	78	76	2	72	72	0	0	0	0	194	180	14	22.35	22.06	0	55.59	22.94
38	Naduan	1580	151	148	3	43	41	2	2	2	0	106	96	10	50	14.24	0.66	35.10	19.11
39	Balarampur	4402	194	191	3	44	34	10	10	8	2	172	147	25	46.19	10.48	2.38	40.95	39.54
40	Belabhali	872	388	367	21	199	100	99	39	35	4	574	540	34	32.09	17.20	3.23	47.48	23.65
41	Mangalpur	683	191	187	4	38	25	14	14	14	0	185	180	5	39.63	19.09	2.90	38.38	70.57
42	Paikchatra	874	102	97	5	6	2	4	4	4	0	115	108	7	44.74	3.07	1.75	50.44	26.09
43	Jalasuan	748	55	50	1	142	111	31	8	5	3	120	110	10	21.32	29.07	3.10	46.51	34.49
44	Suanpada	593	53	53	0	32	27	5	5	4	1	132	120	12	23.56	15.56	2.22	58.67	37.94
45	Dhinkia	2158	60	56	4	9	2	7	16	16	0	97	87	10	32.61	5.98	8.70	52.72	38.53
46	Kodapada	1112	146	140	6	188	122	66	81	64	17	256	237	19	19.78	34.55	10.98	34.69	66.37
47	Gobindapur	577	254	237	17	24	20	4	2	1	1	45	40	5	77.20	8.51	0.61	13.68	57.02
48	Gohirabani	1694	63	50	13	120	92	28	6	1	5	25	17	8	16.62	75.20	1.58	6.60	22.37
49	Talagaon	1327	104	101	3	292	204	88	11	9	2	61	50	11	15.48	73.81	1.64	9.08	50.64
50	Sadangi	1890	180	155	25	235	118	117	13	10	3	163	133	30	25.39	49.79	1.83	22.99	37.51
51	Gohira	3958	53	48	5	317	317	0	12	12	0	203	149	54	5.88	70.29	1.33	22.51	32.28
52	Anandpur (M)	62	1450	1412	38	1389	1200	189	877	503	374	8661	7387	1274	11.63	11.90	7.03	69.44	20.13
53	Palaspur	784	12	12	0	3	3	0	0	0	0	6	6	0	57.14	14.29	0	28.57	42.68
54	Kumunia	530	111	84	27	46	21	25	33	5	28	174	97	77	25.52	26.90	7.59	40	42.2

55	Indupura	1016	89	88	1	14	13	1	1	1	0	28	26	2	67.42	10.61	0.76	21.21	12.9
56	Kainpura	762	183	178	5	7	4	3	4	4	0	70	62	8	68.28	4.10	1.49	26.12	35.17
57	Jhadakhundi	385	55	55	0	101	95	6	9	9	0	71	64	7	22.45	44.90	3.67	28.98	63.64
58	Chamuhin	543	81	80	1	2	2	0	4	4	0	11	7	4	81	4	4	11	18.42
59	Vatisira	3570	69	68	1	20	17	3	3	3	0	79	69	10	40.35	11.70	1.75	46.20	44.79
60	Bancho	1403	420	410	10	293	260	33	3	3	0	339	301	38	39.62	28.11	0.28	31.98	75.55
61	Bailo	980	122	120	2	98	90	8	6	5	1	138	127	11	33.15	27.72	1.63	37.5	37.55
62	Guhalia	900	93	89	4	177	150	27	14	10	4	52	44	8	25.41	56.56	3.83	14.21	40.67
63	Nuapada	879	78	78	0	122	100	220	0	0	0	53	45	8	16.92	71.58	0	11.50	52.45
64	Banika	1028	88	80	8	105	101	4	1	1	0	43	39	4	36.51	45.23	0.41	17.84	23.44
65	Khadibil	1011	107	106	1	128	28	100	1	1	0	21	12	9	41.15	50.38	0.38	8.08	25.72
66	Barigaon	820	194	188	6	192	150	42	1	1	0	48	44	4	42.45	46.83	0.22	10.50	55.73
67	Hatibandha	5415	121	117	4	38	35	3	9	9	0	100	86	14	45.15	14.18	3.36	37.31	24.95
68	Panchupali	244	501	495	6	757	650	107	6	5	1	326	296	30	30.49	49.30	0.37	19.84	67.36
69	Sibanarayanpur	625	22	14	8	54	24	30	2	1	1	26	23	3	26.83	39.02	2.44	31.71	13.12
70	Atasahipatana	1356	91	91	0	3	2	1	1	1	0	67	56	11	56.17	1.85	0.62	41.36	11.95
71	Atasahi	1460	125	124	1	114	111	3	15	14	1	136	125	11	31.97	29.41	3.84	34.78	26.78
72	Sarei	360	278	210	68	109	104	5	17	12	5	339	162	177	32.55	25.76	1.99	39.70	23.22
73	Hatisila	812	56	54	2	39	39	0	0	0	0	10	4	6	28.87	65.98	0	5.15	23.89
74	Kochianendi	1105	121	117	4	33	33	0	0	0	0	106	88	18	40.88	23.31	0	35.81	26.79
75	Satatira	568	99	99	0	225	180	45	0	0	0	38	30	8	26.68	63.07	0	10.24	65.32
76	Raghabpur	181	15	14	1	29	6	23	23	23	0	76	71	5	10.42	20.83	15.97	52.78	79.56
77	Deogaon	916	11	10	1	105	49	57	12	11	1	57	50	7	12.79	6.98	13.95	66.28	49.39
78	Adghuria	1385	34	33	1	71	70	1	1	1	0	120	114	6	14.98	31.72	0.44	52.86	16.39
79	Bhaganai	2287	140	139	1	71	53	18	18	18	0	180	166	14	34.15	17.56	4.39	43.90	17.93
80	Tolankapada	724	191	183	8	131	122	9	53	52	1	256	244	12	30.13	21.14	8.36	40.38	45.57
81	Kanpur	802	108	107	1	5	5	0	0	0	0	64	59	5	61.02	2.82	0	36.16	22.07
82	Uchabali	394	108	102	6	34	30	4	0	0	0	103	86	17	32.93	35.67	0	31.40	45. 5
83	Dipapal	783	72	71	1	24	5	19	19	19	0	23	18	5	51.80	17.99	13.67	16.55	17.75
84	Sanabadabila	593	25	23	2	84	50	34	16	12	4	133	123	10	5.31	63.06	3.40	28.24	39.43
85	Dhinkia	153	60	56	4	9	2	7	16	16	0	97	87	10	32.61	5.98	8.70	52.72	12.26
86	Hirapur	518	42	25	17	13	12	1	0	0	0	31	29	2	48.28	16.09	0	35.63	16.80

87	Siapada	139	166	163	3	2	2	0	0	0	0	10	7	3	93.26	1.12	0	5.62	29.06
88	Sahanadpur	367	2	1	1	21	20	1	1	1	0	21	21	0	4.17	50	2.08	43.75	13.08
89	Mugupur	643	6	6	0	18	18	6	6	6	0	60	57	3	6.67	20	6.67	66.67	14.00
90	Haridapal	537	113	108	5	49	40	9	0	0	0	36	33	3	57.07	24.75	0	18.18	36.87
91	Tikara	402	27	26	1	43	48	1	1	1	0	94	89	5	16.27	26.51	0.60	56.63	41.29
92	Godipatna	783	56	56	0	8	7	1	1	1	0	47	38	9	50	7.14	0.89	41.96	14.30
93	Tarava	236	100	99	1	17	15	2	0	0	0	129	119	10	40.49	7.29	0	52.23	38.66
94	Naukana	1244	25	25	0	33	21	12	0	0	0	6	6	0	39.06	51.56	0	9.375	35.14
95	Bamphidi	1269	117	115	2	192	145	47	21	20	1	39	34	5	24.74	62.58	4.44	8.25	37.27
96	Nayagarh	1191	200	110	90	22	3	19	100	91	9	342	300	42	25.94	16.73	12.97	44.36	64.74
97	Ambo	729	176	175	1	121	95	26	6	6	0	34	25	9	49.72	38.98	1.69	9.60	48.56
98	Pahadpur	943	133	125	8	2	1	1	1	1	0	163	161	2	44.33	1	0.33	54.33	31.81
99	Panchara	667	91	89	2	95	60	35	6	5	1	78	72	6	30.23	41.86	1.99	25.91	45.13
100	Patilo	1049	62	61	1	68	60	8	9	6	3	51	44	7	31.16	38.69	4.52	25.63	18.97
101	Khadikasulabahali	284	137	135	2	81	80	1	5	2	3	104	95	9	41.14	26.13	1.50	31.23	35.25
102	Kothasahi	335	5	5	0	65	58	7	0	0	0	27	24	3	5.05	67.68	0	27.27	29.55
103	Anjira	97	24	24	0	58	2	56	0	0	0	11	5	6	25.26	63.16	0	11.58	62.94
104	Fatepur	827	11	11	0	0	0	0	1	1	0	11	10	1	47.83	0	4.35	47.83	42.78
105	Agarda	977	44	44	0	157	150	7	5	5	0	32	28	4	17.96	66.94	2.04	13.06	25.08
106	Nuagaon	1414	8	7	1	0	0	0	1	1	0	332	269	63	2.33	0.87	0.29	96.51	24.33
107	Madhukesari	125	80	80	0	265	260	5	4	4	0	74	64	10	18.60	63.26	0.93	17.21	34.00
108	Dihakatina	2325	23	22	1	5	2	3	7	0	7	6	4	2	53.49	16.28	16.28	13.95	51.85
109	Garhbandhogoda	282	238	229	9	155	140	15	4	3	1	251	230	21	35.74	25.98	0.60	37.69	23.17
110	Malikatina	87	61	53	8	1	0	1	1	0	1	8	2	6	82.43	5.41	1.35	10.81	55.06
111	Gainthagodi	1707	8	8	0	7	5	2	2	2	0	9	9	0	30.77	26.92	7.69	34.62	41.52
112	Atta	403	124	122	2	130	125	5	21	21	0	221	197	24	24.75	26.95	4.19	44.11	12.32
113	Kainsiari	898	77	77	0	52	34	18	2	2	0	26	23	3	40.31	45.03	1.05	13.61	21.27
114	Ullol	158	78	75	3	56	50	6	3	3	0	122	112	10	29.43	23.40	1.13	46.04	16.72
115	Mangalagadia	1002	32	31	1	0	0	0	2	2	0	8	7	1	76.19	0	4.76	19.05	34.19
116	Girigaon	472	243	241	2	37	2	35	0	0	0	48	39	9	73.64	11.82	0	14.55	69.92
117	Kantabania	437	91	86	5	4	3	1	1	1	0	35	29	6	69.47	3.05	0.76	26.72	29.98

118	Chandali	883	119	113	6	2	1	1	1	1	0	16	10	6	86.23	1.45	0.72	11.59	15.63
119	Baharipur	285	82	78	4	121	11	110	6	5	1	28	21	7	33.06	53.23	2.42	11.29	52.02
120	Jarak	351	36	36	0	39	16	23	0	0	0	8	8	0	36.36	55.56	0	8.08	28.21
121	Sanapadana	103	20	20	0	19	5	14	14	14	0	55	49	6	18.35	18.35	12.84	50.46	45.83
122	Bahugadia	318	14	14	0	8	8	0	0	0	0	3	3	0	53.85	34.62	0	11.54	28.18
123	Haripur	836	69	69	0	2	2	0	0	0	0	16	15	1	79.31	2.30	0	18.39	10.41
124	Baniapasi	523	152	144	8	26	4	22	1	0	1	299	91	208	31.54	6.22	0.21	62.03	48.61
125	Bramhanda	736	66	65	1	0	0	0	1	1	0	60	58	2	51.97	0	0.79	47.24	17.26
126	Suanlo	454	143	140	3	7	3	4	0	0	0	63	59	4	66.20	4.63	0	29.17	47.58
127	Valuka	404	56	54	2	45	43	2	2	2	0	30	28	2	42.11	33.83	1.50	22.56	32.92
128	Napanga	651	24	20	4	62	61	1	1	1	0	22	20	2	21.82	57.27	0.91	20	16.90
129	Mahuri	476	123	123	0	11	10	1	1	1	0	34	30	4	72.78	6.51	0.59	20.12	35.50
130	Ujuni	335	116	114	2	1	1	0	0	0	0	23	19	4	82.86	0.71	0	16.43	41.91
131	Balibaruan	119	15	15	0	66	65	1	1	1	0	13	12	1	15.46	70.10	1.03	13.40	31.51
132	Bhandaripada	416	11	11	0	8	7	1	1	1	0	13	11	2	33.33	24.24	3.03	39.39	37.93
133	Kaithapatna	1937	62	61	1	14	12	2	2	2	0	31	24	7	56.36	13.64	1.82	28.18	45.68
134	Padanpur	2357	325	320	5	30	25	5	37	37	0	294	200	94	47.31	4.51	5.39	42.79	29.15
135	Badapadana	1425	179	178	1	210	180	30	9	8	1	303	293	10	25.11	31.14	1.26	42.50	50.04
136	Saladei	626	210	208	2	55	51	4	4	4	0	89	75	14	58.17	16.07	1.11	24.65	57.67
137	Kendukhunta	1568	121	116	5	7	5	2	2	2	0	39	32	7	71.60	4.14	1.18	23.08	10.78
138	Samana	270	291	283	8	98	95	3	2	2	0	116	103	13	56.84	20.12	0.39	22.66	18.63
139	Karadamali	760	42	42	0	1	1	0	0	0	0	30	27	3	57.53	1.37	0	41.10	59.61
140	Belasundari	367	32	28	4	67	65	2	2	2	0	94	82	12	16	36	1	47	54.50
141	Gudiadihi	617	21	21	0	66	36	30	0	0	0	21	19	2	17.36	65.29	0	17.36	19.61
142	Narda	463	68	67	1	57	55	2	0	0	0	47	38	9	39.08	33.91	0	27.01	37.58
143	Janardanpurpatna	297	44	39	5	60	58	2	2	2	0	25	21	4	31.88	48.55	1.45	18.12	46.46
144	Aligaon	664	94	87	7	3	3	0	0	0	0	5	5	0	92.16	2.94	0	4.90	15.36
145	Odapada	762	113	112	1	49	45	4	0	0	0	42	33	9	55.39	24.02	0	20.59	26.77
146	Purunabandhogoda	556	108	108	0	8	7	1	1	1	0	116	106	10	46.35	3.43	0.43	49.79	41.91
147	Jarda	357	77	76	1	34	32	2	2	2	0	60	55	5	44.25	20.11	1.15	34.48	48.74
148	Katenikantal	717	11	11	0	55	51	4	4	4	0	37	33	4	9.65	54.39	3.51	32.46	15.90

149	Sainpal	600	158	154	4	5	5	0	0	0	0	7	6	1	92.94	2.94	0	4.12	28.33
150	Bilabandha	154	105	100	5	25	19	6	4	2	2	46	41	5	52.76	22.11	2.01	23.12	12.22
151	Guhaldihi	60	30	30	0	13	12	1	0	0	0	6	6	0	60	28	0	12	33.33
152	Ganpur	605	6	6	0	0	0	0	1	1	0	0	0	0	85.71	0	14.29	0	61.16
153	Kolipal	1134	69	67	2	62	5	57	4	3	1	67	62	5	33.33	32.37	1.93	32.37	18.25
154	Nuhamalia	463	161	160	1	134	130	4	3	2	1	11	10	1	30.73	66.60	0.57	2.10	11.17
155	Beladiha	2254	23	21	2	111	94	17	1	1	0	0	0	0	10.04	89.52	0.44	0	10.16
156	Biragobindapur	352	201	196	5	278	220	58	7	6	1	173	156	17	20	62.09	0.70	17.21	28.51
157	Belada	2012	0	0	0	40	10	30	13	13	0	41	38	3	0	48.08	12.5	39.42	45.17
158	Baunspal	860	379	277	102	149	131	18	11	11	0	380	270	110	36.10	26.67	1.05	36.19	12.09
159	Gobargali	530	39	4	35	21	19	2	2	1	1	255	213	42	12.30	6.62	0.63	80.44	36.86

Literacy potential of the study area (in Dhenkanal District):

Sl. No.	Village Name	Total Population	Literates			Illiterates			Literacy Rate	Illiteracy Rate
			Total	Male	Female	Total	Male	Female		
1.	Kanaka	402	236	151	85	166	41	125	58.71	41.29
2.	Kankarpur	150	62	43	19	88	40	48	41.34	58.66
3.	Analakata	830	505	304	201	325	123	202	60.85	39.15
4.	Jayapurakateni	2036	1448	791	657	588	243	345	71.12	28.88
5.	Denga Bahali	435	175	118	57	260	101	159	40.23	59.77
6.	Kenduapada	650	207	119	88	443	190	253	31.85	68.15
7.	Bhuban P.S	101051	71842	40086	31756	29209	11909	17303	71.09	28.91
8.	Odisha	4021	2512	1422	1090	1509	610	899	62.47	37.53
9	Kumurasinga	530	373	218	155	157	57	100	70.38	29.62
10.	Kuninda	1626	1182	629	553	444	175	269	72.69	27.31
11.	Khoksa(L)	296	236	138	98	60	19	41	79.72	20.28
12.	Khoksa(R)	333	259	149	110	74	31	43	77.77	22.23
13.	Baruan	1323	1101	576	525	222	93	129	83.21	16.79
14.	Kansaragoda	1066	568	331	237	498	224	274	53.28	46.72
15.	Dhalapada	747	573	307	266	174	79	95	76.7	23.3
16.	Kainsiri	1250	883	499	384	367	143	224	70.64	29.36
17.	Muruga	1112	816	465	351	296	114	182	73.38	26.62
18.	Balijhati	569	488	239	249	81	45	36	85.76	14.24
19.	Anantapur	912	523	320	203	389	172	217	57.34	42.66
20.	Garudabandi	931	585	350	235	346	126	220	62.83	37.17
21.	Nayanilakanthapur	448	352	199	153	96	34	62	78.57	21.43
22.	patapur	392	304	174	130	88	31	57	77.55	22.45
23.	Jaypur	1429	908	547	361	521	186	335	63.54	36.46
24.	Kingol	667	531	295	236	136	64	72	79.61	20.39
25.	Kirtanpur	1240	718	432	286	522	212	310	57.9	42.1
26.	Bhusala	2302	1679	938	741	623	269	354	72.93	27.07
27.	Praharajpur	102	81	39	42	21	7	14	79.41	20.59
28.	kanapalsamilmahulpal	3600	2760	1514	1246	840	352	488	76.66	23.34
29.	Chandipal	1005	749	421	328	256	89	167	74.52	25.48
30.	Karadabani	1115	751	410	341	364	145	219	67.35	32.65
31.	Kanapal	207	161	98	63	46	16	30	77.77	22.23

32.	Sitalabasa	536	404	227	177	132	41	91	75.37	24.63
33.	Kankana	1704	1129	653	476	575	241	334	66.26	33.74
34.	Anala	1487	1112	627	485	375	139	236	74.78	25.22
35.	Senanda	240	104	65	39	136	43	93	43.33	56.67
36.	Brahmankhantakhol	212	112	72	40	100	42	58	52.83	47.17
37.	Hariamaru	139	99	56	43	40	17	23	71.22	28.78
38.	Kendupada	807	618	344	274	189	70	119	76.58	23.42
39.	Mathanuagan	834	561	321	240	273	112	161	67.27	32.73
40.	Balipada	22	19	9	10	3	0	3	86.36	13.64
41.	Renadapatana	906	630	352	278	276	121	155	69.54	30.46
42.	Palasapithia	1280	810	448	362	470	198	272	63.28	36.72
43.	Gabagoda	165	137	79	58	28	11	17	83.03	16.97
44.	Solagadia	1663	1234	684	550	429	188	241	74.20	25.80
45.	Ichhapur	23	8	3	5	15	6	9	34.78	65.22
46	Basudeipur	572	403	220	183	169	71	98	70.45	29.55
47.	Dayanabili	819	598	327	271	221	78	143	73.02	26.98
48.	Gamargola	81	53	31	22	28	6	22	65.43	34.57
49.	Garhnrusinghaprasad	1753	1153	660	493	600	265	335	65.77	34.23
50.	Anlajhari	1538	1169	643	526	369	155	214	76.01	23.99
51.	Kankhai	720	497	284	213	223	84	139	69.03	30.97
52.	Kesharpur	500	390	211	179	110	53	57	78.00	22.00
53.	Balibo(L)	2573	2100	1135	965	473	198	275	81.62	18.38
54.	Samal	541	387	208	179	154	47	107	71.53	28.47
55.	Tipilei	1162	832	474	358	330	129	201	71.60	28.40
56.	Chhatakhamb	12	10	6	4	2	1	1	83.33	16.67
57.	Kumarda	237	125	77	48	112	41	71	52.74	47.26
58.	Dadhisinga	100	54	27	27	46	21	25	54.00	46.00
60.	Naraharipur	237	164	89	75	73	30	43	69.20	30.80
61.	Surapratappur	5776	3829	2156	1673	1947	856	1091	66.29	33.71
62.	Kunda	1230	916	505	411	314	135	179	74.47	25.53
63.	Sundhikateni	1023	642	370	272	381	151	230	62.76	37.24
64.	Kanchanbahali	311	108	63	45	203	92	111	34.73	65.27
65.	Asurabandha	1173	784	437	347	389	157	232	66.84	33.16
66.	Arilo	78	31	23	8	47	21	26	39.74	60.26
67.	Gadganpur	1122	887	480	407	235	88	147	79.06	20.94

68.	Chandar	941	696	360	336	245	94	151	73.96	26.04
69.	Gopalpur	740	555	311	244	185	96	89	75.00	25.00
70.	Gobindabidyadharpur	92	41	22	19	51	26	25	44.57	55.43
71.	Malapura	1807	1300	715	585	507	188	319	71.94	28.06
72.	Nimeinpur	987	706	365	341	281	106	175	71.53	28.47
73.	Rodanga	125	76	46	30	49	24	25	60.80	39.20
74.	Asurabandha Patana	926	615	346	269	311	126	185	66.41	33.59
75.	Mrudanga	2716	1996	1143	853	720	287	433	73.49	26.51
76.	Bentashalia	368	306	163	143	62	27	35	83.15	16.85
77.	Ekatali(Kha)	2009	1181	652	529	828	343	485	58.79	41.21
78.	Ekatali(Ka)	101	78	47	31	23	10	13	77.23	22.77
79.	Brahmapur	111	91	53	38	20	9	11	81.98	18.02
80.	Majhipal	496	211	155	56	285	95	190	42.54	57.46
81.	Nilakanthapur	1023	737	422	315	286	125	161	72.04	27.96
82.	Sarangapur	97	81	42	39	16	6	10	83.51	16.49
83.	Hatibari	501	304	171	133	197	81	116	60.68	39.32
84.	Purastampur	1216	856	456	400	360	154	206	70.39	29.61
85.	Koriapal	1087	721	383	338	366	123	243	66.33	33.67
86.	Darjani	802	543	313	230	259	120	139	67.71	32.29
87.	Maluagoda	492	257	141	116	235	87	148	52.24	47.76
88.	Joragadia	85	28	21	7	57	26	31	32.94	67.06
89.	Kankadahad	458	1530	838	692	584	252	332	72.37	27.63

In JAJPUR District

Sl. No.	Village Name	Literates			Illiterates			Literacy Rate	Illiteracy Rate
		Total	Male	Female	Total	Male	Female		
1	Ichhapur	511	280	231	119	49	70	81.11	18.89
2	jalanda	479	269	210	194	92	102	71.17	28.83
3	Tarakote	2071	1109	962	804	332	472	72.03	27.97
4	Barada	913	509	404	275	128	147	76.85	23.15
5	Tentulikhunta	395	222	173	168	70	98	70.16	29.84
6	Kayan	2574	1318	1256	1010	404	606	71.82	28.18
7	Tulati	848	459	389	257	108	149	76.74	23.26
8	Pimpal	324	174	150	158	56	102	67.22	32.78
9	Jaintala	219	118	101	74	28	46	74.74	25.26
10	Toranda	370	204	166	79	30	49	82.41	17.59
11	Solabandi	872	463	409	236	104	132	78.70	21.30
12	Chingudipur	139	78	61	39	22	17	78.09	21.91
13	Haladigadia	1242	666	576	384	156	228	76.38	23.62
14	Kogan	359	196	163	100	40	60	78.21	21.79
15	Talagadia	363	210	153	88	37	51	80.49	19.51
16	Asanjhar	598	354	244	442	172	270	57.50	42.50
17	Ranapur	977	533	444	310	113	197	75.91	24.09
18	Gajendrapur	580	324	256	177	81	96	76.62	23.38
19	Jugala	578	326	252	139	47	92	80.61	19.39
20	Mathurapur	542	312	230	279	106	173	66.02	33.98
21	Nisankhapur	162	85	77	62	26	36	72.32	27.68
22	Salaba	366	201	165	206	96	110	63.99	36.01
23	Barundai	2541	1349	1192	709	291	418	78.18	21.82
24	Bangarakota	1276	717	559	467	213	254	73.21	26.79
25	Khiro	585	330	255	311	141	170	65.29	34.71
26	Banhara	240	119	121	37	14	23	86.64	13.36
27	Amrutia	1610	864	746	640	243	397	71.56	28.44
28	Mulapal	522	285	237	275	134	141	65.50	34.50
29	Kantigadia	951	515	436	274	111	163	77.63	22.37

30	Sathipur	1296	719	577	469	189	280	73.43	26.57
31	Balipasi	392	208	184	83	40	43	82.53	17.47
32	Manipur	399	219	180	100	41	59	79.96	20.04
33	Panikoili P.S	48514	26606	21908	16872	6933	9939	74.20	25.80
34	Harichandpur	110	63	47	41	18	23	72.85	27.15
35	Mirjapur	1622	824	798	467	206	261	77.64	22.36
36	Ambatola	259	138	121	59	26	33	81.45	18.55
37	Solapatta	745	392	353	215	98	117	77.60	22.40
38	Radhanagar	29	18	11	17	6	11	63.04	36.96
39	Thakurpatana	1020	567	453	327	128	199	75.72	24.28
40	Santarapur	481	307	174	703	285	418	40.63	59.38
41	Talugan	426	236	190	210	90	120	66.98	33.02
42	Dhaneswar	1004	528	476	377	172	205	72.70	27.30
43	Balia Pasi	223	118	105	76	30	46	74.58	25.42
44	Chakua	415	227	188	107	48	59	79.50	20.50
45	Marutikar	952	588	364	1052	440	612	47.50	52.50
46	Damodarpur	29	14	15	13	5	8	69.05	30.95
47	Kumbhirigadia	1203	685	518	461	184	277	72.30	27.70
48	Jakhapura P.S	11872	6604	5268	5552	2195	3357	68.14	31.86
49	Boulanga	870	461	409	268	98	170	76.45	23.55
50	Mangalpur	1084	680	404	1056	400	656	50.65	49.35
51	Telibedha	207	127	80	64	17	47	76.38	23.62
52	Nuagan	273	164	109	208	84	124	56.76	43.24
53	Ollala	584	341	243	489	212	277	54.43	45.57
54	Mulasar	687	389	298	306	126	180	69.18	30.82
55	Dankari	621	342	279	328	123	205	65.44	34.56
56	Kusunpur	283	166	117	125	50	75	69.36	30.64
57	Tikarapada	1164	632	532	375	144	231	75.63	24.37
58	Nandakishore Pur	424	226	198	124	53	71	77.37	22.63
59	Ranipada	600	323	277	161	80	81	78.84	21.16
60	Dhuligarh	1206	730	476	1336	539	797	47.44	52.56
61	Dhabahali	142	92	50	173	71	102	45.08	54.92
62	Jhatiasahi	98	54	44	34	14	20	74.24	25.76

63	Jajpur Sadar P.S	93098	51155	41943	34680	14047	20633	72.86	27.14
64	Janara	270	146	124	129	54	75	67.67	32.33
65	Jhumpan	294	161	133	87	37	50	77.17	22.83
66	Upulei	553	315	238	219	83	136	71.63	28.37
67	Sadakpur	1322	725	597	476	184	292	73.53	26.47
68	Korai P.S	70254	38209	32045	26620	10999	15621	72.52	27.48
69	Santarapur	481	307	174	703	285	418	40.63	59.38
70	Panasua	123	59	64	32	17	15	79.35	20.65
71	Khamigan	677	365	312	315	134	181	68.25	31.75
72	Pataranga	1211	639	572	499	225	274	70.82	29.18
73	Dhanapur	667	359	308	231	92	139	74.28	25.72
74	Korabandi	1312	690	622	378	171	207	77.63	22.37
75	Ragada	1005	600	405	1175	517	658	46.10	53.90
76	Kantore	971	525	446	261	114	147	78.81	21.19
77	Mantira	470	273	197	214	77	137	68.71	31.29
78	Bhatasolapat	509	287	222	146	51	95	77.71	22.29
79	Janara	270	146	124	129	54	75	67.67	32.33
80	Mangobindapur	1467	864	603	818	339	479	64.20	35.80
81	Kacheri Gan	176	128	48	530	220	310	24.93	75.07
82	Uparagarh	163	94	69	161	74	87	50.31	49.69
83	Kantia	1284	660	624	736	305	431	63.56	36.44
84	Barakhai	683	394	289	276	102	174	71.22	28.78
85	Nadia Bhanga	1084	664	420	1196	535	661	47.54	52.46
86	Khandia Bandi	377	199	178	128	41	87	74.65	25.35
87	Madhapur	310	184	126	117	54	63	72.60	27.40
88	Sarangapur	1044	604	440	701	295	406	59.83	40.17
89	Champa	241	131	110	149	59	90	61.79	38.21
90	Khurunti	941	614	327	1036	387	649	47.60	52.40
91	Gobara Ghati	2739	1727	1012	2225	826	1399	55.18	44.82
92	Chandia	435	267	168	864	358	506	33.49	66.51
93	Ankura Pal	378	245	133	573	207	366	39.75	60.25
94	Ramachandrapur	472	247	225	141	67	74	77.00	23.00
95	Nilamanidei Pursasan	602	332	270	120	40	80	83.38	16.62

96	Digambarpur	320	176	144	93	38	55	77.48	22.52
97	Sana Pingal	302	172	130	70	23	47	81.18	18.82
98	Bada Pingal	1324	787	537	613	230	383	68.35	31.65
99	Nimapali	1576	891	685	819	343	476	65.80	34.20
100	Golagan	718	443	275	720	301	419	49.93	50.07
101	Baghuapal	436	200	236	564	229	335	43.60	56.40
102	Bharada Pasi	144	102	42	239	84	155	37.60	62.40
103	Kantira	880	516	364	568	234	334	60.77	39.23
104	Atta	2319	1252	1067	927	401	526	71.44	28.56
105	Bartanda	1769	1010	759	662	278	384	72.77	27.23
106	Bahabalpur	562	303	259	227	91	136	71.23	28.77
107	Haripur	2348	1314	1034	1323	613	710	63.96	36.04
108	Gahira Patuli	279	157	122	109	40	69	71.91	28.09
109	Hatibari	3000	1604	1396	1064	423	641	73.82	26.18
110	Karadapal	418	238	180	116	43	73	78.28	21.72
111	Bairimal	1417	816	601	536	197	339	72.56	27.44
112	Bhalukipatala	715	424	291	458	195	263	60.95	39.05
113	Garamian	708	470	238	1165	492	673	37.80	62.20
114	Kankadapal	757	422	335	285	101	184	72.65	27.35
115	Bambilo	1444	830	614	673	272	401	68.21	31.79
116	Botalanda	1496	851	645	835	340	495	64.18	35.82
117	Kuhika	745	451	294	605	246	359	55.19	44.81
118	Gandhapal	806	469	337	401	156	245	66.78	33.22
119	Mulakhamba	281	180	101	164	43	121	63.15	36.85
120	Nuadihi	452	245	207	219	83	136	67.36	32.64
121	Manatira	1928	1025	903	745	293	452	72.13	27.87
122	Barabati	948	476	472	288	134	154	76.70	23.30
123	Mangalpur	1084	680	404	1056	400	656	50.65	49.35
124	Uchabali	1095	577	518	340	137	203	76.31	23.69
125	Badabil	399	218	181	80	34	46	83.30	16.70
126	Kumbhanagara	268	145	123	67	23	44	80.00	20.00
127	Gouda Bahali	301	174	127	103	35	68	74.50	25.50
128	Ragadi	957	552	405	347	150	197	73.39	26.61

129	Tura	222	117	105	44	12	32	83.46	16.54
130	Tarailo	826	458	368	261	92	169	75.99	24.01
131	Nachhipura	1061	620	441	834	361	473	55.99	44.01
132	Kharadabandi	491	274	217	213	83	130	69.74	30.26
133	Chitri	2413	1357	1056	1346	545	801	64.19	35.81
134	Salijanga	1611	964	647	1451	597	854	52.61	47.39
135	Godarapal	235	132	103	114	36	78	67.34	32.66
136	Routpada	639	354	285	343	135	208	65.07	34.93
137	Andhari	748	403	345	244	97	147	75.40	24.60
138	Kadama	1384	778	606	827	324	503	62.60	37.40
139	Kiapada	990	552	438	450	175	275	68.75	31.25
140	Gopalpur	328	188	140	116	47	69	73.87	26.13
141	Raghupur	296	165	131	79	33	46	78.93	21.07
142	Ramakrishnapur	519	276	243	128	50	78	80.22	19.78
143	Belada	204	118	86	61	17	44	76.98	23.02
144	Mahulia	431	239	192	136	48	88	76.01	23.99
145	Paramanandapur	992	539	453	254	101	153	79.61	20.39
146	Aranto	5	4	1	5	2	3	50.00	50.00
147	Patarakana	340	186	154	212	82	130	61.59	38.41
148	Sampur	77	47	30	20	8	12	79.38	20.62
149	Sanla	595	333	262	311	113	198	65.67	34.33
150	Kacharasahi	1067	559	508	305	138	167	77.77	22.23
151	Bachhipur	378	212	166	110	36	74	77.46	22.54
152	Sitalgobindpur	269	150	119	106	34	72	71.73	28.27
153	Pachhikote	765	435	330	392	146	246	66.12	33.88
154	Sunachara	125	66	59	30	15	15	80.65	19.35
155	Nayahatpatna	298	171	127	135	51	84	68.82	31.18
156	Mukundapur	2080	1146	934	894	366	528	69.94	30.06
157	Ranagundi	866	519	347	698	292	406	55.37	44.63
158	Tulasipur	659	353	306	275	100	175	70.56	29.44
159	Gourpur	432	236	196	182	74	108	70.36	29.64
160	Baliapal	724	472	252	1569	667	902	31.57	68.43
161	Sulia	569	329	240	664	272	392	46.15	53.85

162	Sahaspur	142	73	69	59	23	36	70.65	29.35
163	Purbakote	647	360	287	412	185	227	61.10	38.90
164	Khosalpur	192	96	96	70	29	41	73.28	26.72
165	Narendrabhog	174	95	79	45	19	26	79.45	20.55
166	Manjuri	132	63	69	51	24	27	72.13	27.87
167	Talia	122	68	54	28	12	16	81.33	18.67
168	Gohiragadia	753	425	328	427	170	257	63.81	36.19
169	Asanagadia	338	185	153	168	58	110	66.80	33.20
170	Gayalgadia	55	34	21	81	40	41	40.44	59.56
171	Biridiha	350	175	175	39	20	19	89.97	10.03
172	Barahampur	356	176	180	111	47	64	76.23	23.77
173	Solapatia	318	162	156	93	39	54	77.37	22.63
174	Gamharia	505	272	233	228	86	142	68.89	31.11
175	Oshala	809	417	392	256	120	136	75.96	24.04
176	Rampilo	703	367	336	494	246	248	58.73	41.27
177	Godigotha	644	356	288	501	207	294	56.24	43.76
178	Bainsipur	127	67	60	36	16	20	77.91	22.09
179	Jaintira	137	71	66	22	11	11	86.16	13.84
180	Aranyamadana	338	190	148	122	50	72	73.48	26.52
181	Mandapada	159	78	81	64	23	41	71.30	28.70
182	Jalapatipur	124	62	62	17	7	10	87.94	12.06
183	Pimpudia	1148	700	448	1313	572	741	46.65	53.35
184	Sahagan	427	239	188	159	62	97	72.87	27.13
185	Uttarkota	130	63	67	30	10	20	81.25	18.75
186	Biruanpada	233	114	119	43	15	28	84.42	15.58
187	Mangarajpur	282	150	132	63	22	41	81.74	18.26
188	Uttarakhajira	337	174	163	81	35	46	80.62	19.38
189	Kantapal	153	82	71	155	63	92	49.68	50.32
190	Baragadia	1675	919	756	648	272	376	72.11	27.89
191	Ambapal	422	256	166	398	148	250	51.46	48.54
192	Nigodha	294	154	140	90	37	53	76.56	23.44
193	Chhanchania	46	23	23	17	12	5	73.02	26.98
194	Sansailo	1745	1008	737	1158	482	676	60.11	39.89

195	Gorakhapur	61	35	26	40	17	23	60.40	39.60
196	Pandiapada	33	16	17	6	3	3	84.62	15.38
197	Khaira	237	133	104	104	39	65	69.50	30.50
198	Bandalo	2461	1318	1143	935	342	593	72.47	27.53
199	Jagulaigadia	530	278	252	95	31	64	84.80	15.20
200	Kankadajhar	378	212	166	193	89	104	66.20	33.80
201	Duburi	2973	1625	1348	1306	520	786	69.48	30.52
202	Santasahi	1001	521	480	302	141	161	76.82	23.18
203	Bandhagan	902	476	426	1026	462	564	46.78	53.22
204	Kaduabandi	689	393	296	306	124	182	69.25	30.75
205	Saransa	136	84	52	129	59	70	51.32	48.68
206	Khajurinalua	406	215	191	132	53	79	75.46	24.54
207	Gobaragali	82	44	38	27	10	17	75.23	24.77
208	Gopinathpur	263	148	115	114	39	75	69.76	30.24
209	Jemadeipur	84	68	16	425	181	244	16.50	83.50
210	Khajuribindha	35	20	15	21	7	14	62.50	37.50
211	Kaliapal	230	131	99	150	60	90	60.53	39.47
212	Galiachhanda	476	252	224	136	60	76	77.78	22.22
213	Raghunathpur	171	95	76	54	22	32	76.00	24.00
214	Arjunjhar	125	78	47	304	131	173	29.14	70.86
215	Sundarapokhari	296	163	133	82	34	48	78.31	21.69
216	Rahemanpur	624	343	281	225	81	144	73.50	26.50
217	Akhanpur	176	111	65	99	34	65	64.00	36.00
218	Baragaji	167	102	65	431	205	226	27.93	72.07
219	Routapada	315	175	140	96	28	68	76.64	23.36
220	Kantipur	410	237	173	239	99	140	63.17	36.83
221	Kusumundia	344	209	135	309	118	191	52.68	47.32
222	Gantayatkateni	172	115	57	289	117	172	37.31	62.69
223	Ashokjhar	266	163	103	453	198	255	37.00	63.00
224	Dhapanki	277	155	122	113	43	70	71.03	28.97
225	Kankadagadia	13	7	6	5	4	1	72.22	27.78
226	Krishnapur Sasan	335	176	159	55	26	29	85.90	14.10
227	Bhalukipatala	715	424	291	458	195	263	60.95	39.05

228	Mohammadhosenpur	319	188	131	199	75	124	61.58	38.42
229	Itapur	60	30	30	9	6	3	86.96	13.04
230	Bagira	147	82	65	29	11	18	83.52	16.48
231	Dudhajori	608	348	260	467	207	260	56.56	43.44
232	Naguan	464	234	230	102	40	62	81.98	18.02
233	Padi	186	106	80	103	48	55	64.36	35.64
234	Tarapada	289	148	141	48	17	31	85.76	14.24
235	Taharpur	803	444	359	250	115	135	76.26	23.74
236	Nayagarh	394	229	165	84	33	51	82.43	17.57
237	Sarasada	489	285	204	246	95	151	66.53	33.47
238	Salakana	276	141	135	46	18	28	85.71	14.29
239	Barighodha	727	385	342	321	124	197	69.37	30.63
240	Hatimunda	34	19	15	16	5	11	68.00	32.00
241	Kandaragadia	111	64	47	31	13	18	78.17	21.83
242	Olia	712	406	306	441	189	252	61.75	38.25
243	Banahara	63	33	30	12	6	6	84.00	16.00
244	Sainto	228	129	99	89	35	54	71.92	28.08
245	Kankadapal	757	422	335	285	101	184	72.65	27.35
246	Sisua	63	35	28	40	16	24	61.17	38.83
247	Abhayapur	492	294	198	424	178	246	53.71	46.29
248	Mulasaragada	379	203	176	105	56	49	78.31	21.69
249	Bantala	255	142	113	71	26	45	78.22	21.78
250	Fazalpur	1902	1066	836	1176	529	647	61.79	38.21
251	Rangaranga	755	422	333	208	68	140	78.40	21.60
252	Khilipankha	392	203	189	152	71	81	72.06	27.94
253	Nizigarh	4102	2252	1850	2167	938	1229	65.43	34.57
254	Kuanrada	314	182	132	243	98	145	56.37	43.63
255	Gadapur	201	128	73	165	63	102	54.92	45.08
256	Brahmanda	213	104	109	99	45	54	68.27	31.73
257	Sukaran	750	449	301	750	308	442	50.00	50.00
258	Aladajalasarpur	778	431	347	402	162	240	65.93	34.07
259	Barapal	66	40	26	218	91	127	23.24	76.76
260	Damodar pur	1497	866	631	861	373	488	63.49	36.51

261	Palasa	385	206	179	98	35	63	79.71	20.29
262	Ranasarapur	413	205	208	65	33	32	86.40	13.60
263	Baladia	181	107	74	137	57	80	56.92	43.08
264	Jamupasi	1058	603	455	507	214	293	67.60	32.40
265	Bhakandari	702	393	309	322	136	186	68.55	31.45
266	Baghanata	156	78	78	21	9	12	88.14	11.86
267	Kanchichua	203	130	73	419	180	239	32.64	67.36
268	Kharajabatira	623	321	302	146	71	75	81.01	18.99
269	Mangal Pur	990	570	420	455	179	276	68.51	31.49
270	Adhagan	228	124	104	101	49	52	69.30	30.70
271	Bartamana	618	315	303	157	54	103	79.74	20.26
272	Mrutunjayapur	1326	731	595	348	156	192	79.21	20.79
273	Depada	89	50	39	26	10	16	77.39	22.61
274	Ranigoda	1223	685	538	346	139	207	77.95	22.05
275	Gobindapur	518	290	228	178	73	105	74.43	25.57
276	Mirigi Chara	393	258	135	584	230	354	40.23	59.77
277	Sata Bainsia	180	87	93	55	19	36	76.60	23.40
278	Pubal	264	186	78	594	279	315	30.77	69.23
279	Jakha Pura	3209	1773	1436	943	379	564	77.29	22.71
280	Ochinda	372	196	176	130	56	74	74.10	25.90
281	Ampolaba	850	468	382	408	181	227	67.57	32.43
282	Ranapal	698	396	302	268	104	164	72.26	27.74
283	Khaira dihi	830	457	373	248	107	141	76.99	23.01
284	Begana	299	160	139	117	51	66	71.88	28.13
285	Chillipada	274	155	119	54	22	32	83.54	16.46
286	Gunduchi pasi	473	292	181	466	174	292	50.37	49.63
287	Mulari	385	199	186	131	65	66	74.61	25.39
288	Karada	1978	1074	904	673	260	413	74.61	25.39
289	Khosalapur	71	42	29	31	16	15	69.61	30.39
290	Barapada	199	105	94	169	70	99	54.08	45.92
291	Balunga Bandi	658	362	296	347	139	208	65.47	34.53
292	Taja Pur	347	184	163	275	118	157	55.79	44.21
293	Benapur	210	114	96	59	30	29	78.07	21.93

294	Khasa Gadia	277	152	125	158	69	89	63.68	36.32
295	Brajanagar	524	300	224	166	71	95	75.94	24.06
296	Kharadi	782	478	304	756	311	445	50.85	49.15
297	Bada barunei pada	389	214	175	231	112	119	62.74	37.26
298	Janha	1639	889	750	550	244	306	74.87	25.13
299	Ghikoili	105	60	45	86	32	54	54.97	45.03
300	Pathara Pada	1439	793	646	648	303	345	68.95	31.05
301	Taluri	284	150	134	88	34	54	76.34	23.66
302	Dasamania	560	342	218	501	177	324	52.78	47.22
303	Pancha Batia	45	25	20	6	2	4	88.24	11.76
304	Badasulidiha	932	507	425	623	252	371	59.94	40.06
305	Rachhi Pur	2003	1067	936	571	251	320	77.82	22.18
306	Chhotara Pur	834	474	360	291	124	167	74.13	25.87
307	Nuapada	309	172	137	103	46	57	75.00	25.00
308	Ambasara	567	316	251	635	256	379	47.17	52.83
309	Rudhia	690	378	312	183	70	113	79.04	20.96
310	Oupada	161	93	68	29	4	25	84.74	15.26
311	Janha Kana	401	208	193	158	68	90	71.74	28.26
312	Tailada	57	29	28	25	11	14	69.51	30.49
313	Bajarapada	203	105	98	33	14	19	86.02	13.98
314	Mohammed Jamalpur	440	244	196	161	63	98	73.21	26.79
315	Raitikar	600	325	275	261	91	170	69.69	30.31
316	Alatiri	2137	1148	989	657	293	364	76.49	23.51
317	Khaira Bad	165	81	84	58	24	34	73.99	26.01
318	Nara Pada	334	192	142	311	150	161	51.78	48.22
319	Kuru Pada	477	301	176	221	64	157	68.34	31.66
320	Rabana	1436	789	647	582	230	352	71.16	28.84
321	Bhiki Pur	510	278	232	208	83	125	71.03	28.97
322	Manohar Pur	1201	689	512	651	267	384	64.85	35.15
323	Dania Bar	1077	607	470	624	281	343	63.32	36.68
324	Badhei Tikar	399	206	193	98	35	63	80.28	19.72
325	Hetagadia	138	75	63	40	14	26	77.53	22.47
326	Soti	1331	753	578	456	192	264	74.48	25.52

327	Namatikiri	383	223	160	176	68	108	68.52	31.48
328	Balia Pasi	223	118	105	76	30	46	74.58	25.42
329	Brahman Bad	167	92	75	44	16	28	79.15	20.85
330	Khaman	3091	1692	1399	855	347	508	78.33	21.67
331	Pahanga	1878	999	879	715	316	399	72.43	27.57
332	Nahanda	345	201	144	130	50	80	72.63	27.37
333	Matabad	1010	540	470	306	126	180	76.75	23.25
334	Sendhapur	212	140	72	275	109	166	43.53	56.47
335	Chhatra Kana	349	188	161	206	85	121	62.88	37.12
336	Krushnnagar	544	295	249	114	41	73	82.67	17.33
337	Kaitha	1392	779	613	545	221	324	71.86	28.14
338	Krushnanagar Patna	307	167	140	76	32	44	80.16	19.84
339	Gobinda Pur	139	70	69	31	16	15	81.76	18.24
340	Laxmi Nagar	1943	1054	889	644	258	386	75.11	24.89
341	Gotutha	9	4	5	3	1	2	75.00	25.00
342	Tara Pur	586	337	249	314	121	193	65.11	34.89
343	Sala Pada	360	197	163	193	83	110	65.10	34.90
344	Balarampur	21	12	9	33	17	16	38.89	61.11
345	Naudapur	670	367	303	160	66	94	80.72	19.28
346	Brahmangan	144	76	68	40	15	25	78.26	21.74
347	Khajuri Pur	86	54	32	74	30	44	53.75	46.25
348	Jokadia	574	324	250	219	90	129	72.38	27.62
349	Khapuria Pada	919	504	415	420	186	234	68.63	31.37
350	Rampur Sagadi	526	274	252	93	40	53	84.98	15.02
351	Serapur	290	146	144	67	32	35	81.23	18.77
352	Nuapatna	210	109	101	72	33	39	74.47	25.53
353	Jalaka	612	333	279	154	59	95	79.90	20.10
354	Khandara Pur	161	89	72	56	27	29	74.19	25.81
355	Goleipur	1010	562	448	410	170	240	71.13	28.87
356	Badabiruan	1865	1006	859	620	244	376	75.05	24.95
357	Godipatana	593	312	281	185	79	106	76.22	23.78
358	Benga madha Pur	250	131	119	72	30	42	77.64	22.36
359	Salapari	60	34	26	27	8	19	68.97	31.03

360	Rautra Pur	1039	574	465	356	136	220	74.48	25.52
361	Telia	276	146	130	77	28	49	78.19	21.81
362	Sana Biruan	613	354	259	220	78	142	73.59	26.41
363	Mangaraj Pur	343	195	148	106	42	64	76.39	23.61
364	Banamali Pur	498	256	242	115	45	70	81.24	18.76
365	Banja	625	357	268	323	138	185	65.93	34.07
366	Chhatra Kana	349	188	161	206	85	121	62.88	37.12
367	Kumudisasan	146	84	62	53	19	34	73.37	26.63
368	Talagarh	1665	901	764	441	202	239	79.06	20.94
369	Hatapur	230	128	102	91	27	64	71.65	28.35
370	radha nagar	14	7	7	70	39	31	16.67	83.33
371	Solapur	794	448	346	605	263	342	56.75	43.25
372	Charada	372	196	176	84	37	47	81.58	18.42
373	Dhantri	668	367	301	189	65	124	77.95	22.05

In KEONJHAR District

Sl. No.	Village Name	Literates			Illiterates			Literacy Rate	Illiteracy Rate
		Total	Male	Female	Total	Male	Female		
1.	Indupura	387	199	188	143	67	76	73.01	26.99
2.	Jenapada	359	188	171	115	39	76	75.73	24.27
3.	Nandabar	821	456	365	429	162	267	65.68	34.32
4.	Baranga	742	471	271	749	274	475	49.76	50.24
5.	Beguniadihi	350	199	151	192	78	114	64.57	35.43
6.	Tukuna	1020	577	443	406	148	258	71.52	28.48
7.	Banika	514	306	208	365	150	215	58.47	41.53
8.	Hatibandha	591	344	247	229	76	153	72.07	27.93
9.	Madanpur	1745	976	769	791	322	469	68.80	31.20
10.	Hasanpur	454	259	195	104	38	66	81.36	18.64
11.	Nayagarh	609	369	240	660	263	397	47.99	52.01
12.	Rudranarayanpur	274	145	129	306	141	165	47.24	52.76
13.	Machhalo	1534	796	738	466	194	272	76.7	23.3
14.	Pandua	340	191	149	275	96	179	55.28	44.72
15.	Karadapal	643	389	254	925	368	557	41	59
16.	Bato	1270	720	550	474	151	323	72.82	27.18
17.	Tampo	176	92	84	53	21	32	76.85	23.15
18.	Sainkul P.S	56842	31231	25611	21851	8588	13263	72.23	27.77
19.	Kolhabarapada	474	309	165	1255	565	690	27.41	72.59
20.	Paramanandapur	57	31	26	40	10	30	58.76	41.24
21.	Khalana	2112	1261	851	1046	362	684	66.87	33.13
22.	Dantia	727	367	360	299	97	202	70.85	29.15
23.	Lunahar	447	227	220	160	67	93	73.64	26.36
24.	Patasura	412	226	186	173	74	99	70.42	29.58
25.	Taruan	1107	583	524	276	110	166	80.04	19.96
26.	Brahmanapanga	284	183	101	317	113	204	47.25	52.75
27.	Kendukhunta	486	265	221	140	65	75	77.63	22.37
28.	Ramachandrapur	466	297	169	453	171	282	50.70	49.30

29.	Baranga	791	419	372	212	81	131	78.86	21.14
30.	Angarua	1229	661	568	384	178	206	76.19	23.81
31.	Mathianendi	277	150	127	74	23	51	78.91	21.09
32.	Tigiria	75	52	23	267	118	149	21.92	78.08
33.	Alati	1827	1015	812	473	191	282	79.43	20.57
34.	Raitola	695	369	326	179	66	113	79.51	20.49
35.	Krushnapur	289	165	124	171	63	108	62.82	37.18
36.	Ghasipura P.S	73426	41286	32140	39314	15535	23779	65.12	34.88
37.	Purunian	998	550	448	321	130	191	75.66	24.34
38.	Naduan	1031	535	496	154	61	93	8.69	91.31
39.	Balarampur	1356	739	617	224	103	121	85.82	14.18
40.	Belabhali	3372	1875	1497	1030	417	613	76.60	23.40
41.	Mangalpur	388	245	143	484	206	278	44.49	55.51
42.	Paikchatra	594	307	287	89	51	38	86.96	13.04
43.	Jalasuan	739	397	342	135	42	93	84.55	15.45
44.	Suanpada	526	291	235	222	84	138	70.32	29.68
45.	Dhinkia	430	229	201	163	66	97	72.51	27.49
46.	Kodapada	1551	874	677	607	243	364	71.87	28.13
47.	Gobindapur	522	341	181	590	241	349	46.94	53.06
48.	Gohirabani	328	191	137	249	96	153	56.85	43.15
49.	Talagaon	1045	613	432	649	231	418	61.69	38.31
50.	Sadangi	761	433	328	566	251	315	57.35	42.65
51.	Gohira	1089	659	430	801	286	515	57.62	42.38
52.	Anandpur (M)	29769	16454	13315	9816	4008	5808	75.20	24.80
53.	Palaspur	48	25	23	14	6	8	77.42	22.58
54.	Kumunia	422	268	154	362	129	233	53.83	46.17
55.	Indupura	387	199	188	143	67	76	73.02	26.98
56.	Kainpura	748	387	361	268	110	158	73.62	26.38
57.	Jhadakhundi	464	251	213	298	126	172	60.89	39.11
58.	Chamuhin	227	133	94	158	61	97	58.96	41.04
59.	Vatisira	427	231	196	116	48	68	78.64	21.36
60.	Bancho	2978	1572	1406	592	222	370	83.42	16.58

61.	Bailo	899	502	397	504	202	302	64.08	35.92
62.	Guhalia	618	359	259	362	134	228	63.06	36.94
63.	Nuapada	530	316	214	370	136	234	58.89	41.11
64.	Banika	514	306	208	365	150	215	58.48	41.52
65.	Khadibil	818	422	396	210	99	111	79.57	20.43
66.	Barigaon	603	351	252	408	181	227	59.64	40.36
67.	Hatibandha	591	344	247	229	76	153	72.07	27.93
68.	Panchupali	3645	2051	1594	1770	727	1043	67.31	32.69
69.	Sibanarayanpur	181	89	92	63	22	41	74.18	25.82
70.	Atasahipatana	509	271	238	116	47	69	81.44	18.56
71.	Atasahi	1062	571	491	294	110	184	78.32	21.68
72.	Sarei	785	451	334	675	274	401	53.77	46.23
73.	Hatisila	137	100	37	223	95	128	38.06	61.94
74.	Kochianendi	633	334	299	179	72	107	77.96	22.04
75.	Satatira	840	478	362	265	82	183	76.02	23.98
76.	Raghabpur	446	258	188	122	33	89	78.52	21.48
77.	Deogaon	123	56	67	58	23	35	67.96	32.04
78.	Adghuria	727	392	335	189	63	126	79.37	20.63
79.	Bhaganai	1012	546	466	373	143	230	73.07	26.93
80.	Tolankapada	1711	977	734	576	220	356	74.81	25.19
81.	Kanpur	595	325	270	129	63	66	82.18	17.82
82.	Uchabali	509	296	213	293	118	175	63.47	36.53
83.	Dipapal	319	166	153	75	30	45	80.96	19.04
84.	Sanabadabila	443	269	174	340	122	218	56.58	43.42
85.	Dhinkia	430	229	201	163	66	97	72.51	27.49
86.	Hirapur	90	46	44	63	27	36	58.82	41.18
87.	Siapada	411	225	186	107	37	70	79.34	20.66
88.	Sahanadpur	79	48	31	60	20	40	56.83	43.17
89.	Mugupur	288	149	139	79	25	54	78.47	21.53
90.	Haridapal	486	276	210	157	51	106	75.58	24.42
91.	Tikara	381	209	172	156	75	81	70.95	29.05
92.	Godipatna	329	175	154	73	29	44	81.84	18.16

93.	Tarava	602	319	283	181	87	94	76.88	23.12
94.	Naukana	182	89	93	54	25	29	77.12	22.88
95.	Bamphidi	668	356	312	576	265	311	53.70	46.30
96.	Nayagarh	609	369	240	660	263	397	47.99	52.01
97.	Ambo	892	458	434	299	133	166	74.90	25.10
98.	Pahadpur	373	218	155	356	150	206	51.17	48.83
99.	Panchara	734	403	331	209	59	150	77.84	22.16
100.	Patilo	409	246	163	258	89	169	61.32	38.68
101.	Khadikasulabahali	650	386	264	399	155	244	61.96	38.04
102.	Kothasahi	166	107	59	118	45	73	58.45	41.55
103.	Anjira	260	142	118	75	29	46	77.61	22.39
104.	Fatepur	73	38	35	24	11	13	75.26	24.74
105.	Agarda	616	328	288	211	89	122	74.49	25.51
106.	Nuagaon	444	303	141	533	207	326	45.45	54.55
107.	Madhukesari	1054	604	450	360	154	206	74.54	25.46
108.	Dihakatina	111	58	53	14	6	8	88.80	11.20
109.	Garhbandhogoda	1470	828	642	855	360	495	63.23	36.77
110.	Malikatina	255	122	133	27	15	12	90.43	9.57
111.	Gainthagodi	50	31	19	37	10	27	57.47	42.53
112.	Atta	1379	733	646	328	123	205	80.78	19.22
113.	Kainsiari	354	180	174	49	28	21	87.84	12.16
114.	Ullol	590	322	268	308	126	182	65.70	34.30
115.	Mangalagadia	135	65	70	23	13	10	85.44	14.56
116.	Girigaon	768	424	344	234	97	137	76.65	23.35
117.	Kantabania	389	199	190	83	30	53	82.42	17.58
118.	Chandali	360	187	173	77	31	46	82.38	17.62
119.	Baharipur	734	387	347	149	69	80	83.13	16.87
120.	Jarak	152	91	61	133	55	78	53.33	46.67
121.	Sanapadana	302	159	143	49	11	38	86.04	13.96
122.	Bahugadia	53	30	23	50	18	32	51.46	48.54
123.	Haripur	256	141	115	62	23	39	80.50	19.50
124.	Baniapasi	595	313	282	241	88	153	71.17	28.83
125.	Bamhanda	434	229	205	89	33	56	82.98	17.02

126.	Suanlo	507	284	223	229	94	135	68.89	31.11
127.	Valuka	312	175	137	142	49	93	68.72	31.28
128.	Napanga	249	140	109	155	63	92	61.63	38.37
129.	Mahuri	526	286	240	125	49	76	80.80	19.20
130.	Ujuni	401	221	180	75	34	41	84.24	15.76
131.	Balibaruan	240	141	99	95	35	60	71.64	28.36
132.	Bhandaripada	92	49	43	27	14	13	77.31	22.69
133.	Kaithapatna	308	153	155	108	40	68	74.04	25.96
134.	Padanpur	1510	841	669	427	147	280	77.96	22.04
135.	Badapadana	1757	964	793	600	220	380	74.54	25.46
136.	Saladei	1054	532	522	371	146	225	73.96	26.04
137.	Kendukhunta	486	265	221	140	65	75	77.64	22.36
138.	Samana	1286	705	581	282	126	156	82.02	17.98
139.	Karadamali	222	122	100	48	17	31	82.22	17.78
140.	Belasundari	603	299	304	157	71	86	79.34	20.66
141.	Gudiadihi	186	118	68	181	72	109	50.68	49.32
142.	Narda	484	295	189	133	64	69	78.44	21.56
143.	Janardanpurpatna	350	192	158	113	54	59	75.59	24.41
144.	Aligaon	244	124	120	53	24	29	82.15	17.85
145.	Odapada	520	261	259	144	55	89	78.31	21.69
146.	Purunabandhogoda	640	335	305	122	50	72	83.99	16.01
147.	Jarda	416	229	187	140	56	84	74.82	25.18
148.	Katenikantal	238	137	101	119	42	77	66.67	33.33
149.	Sainpal	587	309	278	130	60	70	81.87	18.13
150.	Bilabandha	350	198	152	250	97	153	58.33	41.67
151.	Guhaldihi	73	44	29	81	35	46	47.40	52.60
152.	Ganpur	21	13	8	39	16	23	35.00	65.00
153.	Kolipal	402	241	161	203	82	121	66.45	33.55
154.	Nuhamalia	569	369	200	565	177	388	50.18	49.82
155.	Beladiha	209	133	76	254	86	168	45.14	54.86
156.	Biragobindapur	1195	698	497	1059	442	617	53.02	46.98
157.	Belada	231	132	99	121	54	67	65.62	34.38

158.	Baunspal	1234	676	558	778	270	508	61.33	38.67
159.	Gobargali	410	286	124	450	156	294	47.67	52.33

Educational facilities in the study area

In Dhenkanal district:

Sl. No.	Village name.	Number of								
		Educational facilities	Primary School	Middle School	Secondary School	Senior Secondary School	Collage	Industrial School	Training School	Adult literacy Class/Centre
1.	Kanapalsamilmahulpal	1	1	1	1	0	0	0	0	0
2.	Praharajpur	2	0	0	0	0	0	0	0	0
3.	Kanapalsamilmahulpal	1	1	1	1	0	0	0	0	0
4.	Purastampur	1	1	1	1	0	0	0	0	0
5.	Purastampur	1	1	1	1	0	0	0	0	0
6.	Sarangapur	2	0	0	0	0	0	0	0	0
7.	Nilakanthapur	1	1	1	0	0	0	0	0	0
8.	Majhipal	2	0	0	0	0	0	0	0	0
9.	Brahmapur	2	0	0	0	0	0	0	0	0
10.	Ekatali(Ka)	2	0	0	0	0	0	0	0	0
11.	Ekatali(Kha)	1	1	1	1	0	0	0	0	0
12.	Bentashalia	1	1	0	0	0	0	0	0	0
13.	Mrudanga	1	1	1	1	1	1	0	0	0
14.	Asurabandha Patana	2	0	0	0	0	0	0	0	0
15.	Rodanga	2	0	0	0	0	0	0	0	0
16.	Bhusala	1	1	1	1	0	0	0	0	0
17.	Nimeinpur	1	1	0	0	0	0	0	0	0
18.	Malapura	2	0	0	0	0	0	0	0	0
19.	Kingol	1	1	1	1	0	0	0	0	0
20.	Gobindabidyadharpur	2	0	0	0	0	0	0	0	0
21.	Kirtanpur	1	1	1	1	0	0	0	0	0
22.	Nayanilakanthapur	1	1	1	1	0	0	0	0	0
23.	Jaypur	1	1	0	0	0	0	0	0	0
24.	Chandar	1	1	1	0	0	0	0	0	0
25.	Gadganpur	1	1	1	0	0	0	0	0	0
26.	Arilo	2	0	0	0	0	0	0	0	0
27.	Asurabandha	1	1	0	0	0	0	0	0	0
28.	Sundhikateni	2	0	0	0	0	0	0	0	0
29.	Kunda	1	1	1	0	0	0	0	0	0
30.	patapur	1	1	0	0	0	0	0	0	0
31.	Surapratappur	1	2	2	2	0	0	0	0	0
32.	Dadhisinga	2	0	0	0	0	0	0	0	0
33.	Kumarda	1	1	0	0	0	0	0	0	0
34.	Chhatakhamb	1	1	0	0	0	0	0	0	0
35.	Baunsakana	1	1	0	0	0	0	0	0	0
36.	Muruga	1	1	1	0	0	0	0	0	0
37.	Tipilei	1	2	1	0	0	0	0	0	0
38.	Samal	1	1	0	0	0	0	0	0	0

39.	Balibo(L)	1	1	1	1	0	0	0	0	0
40.	Garudabandi	1	1	1	0	0	0	0	0	0
41.	Kesharpur	1	1	0	0	0	0	0	0	0
42.	Kankhai	1	1	1	0	0	0	0	0	0
43.	Anlajhari	1	1	1	1	0	0	0	0	0
44.	Garhnrusinghaprasad	1	1	0	0	0	0	0	0	0
45.	Gamargola	2	0	0	0	0	0	0	0	0
46.	Dayanabili	1	1	1	1	0	0	0	0	0
47.	Basudeipur	1	1	1	0	0	0	0	0	0
48.	Anantapur	1	1	1	1	0	0	0	0	0
49.	Ichhapur	2	0	0	0	0	0	0	0	0
50.	Gabagoda	1	1	1	0	0	0	0	0	0
51.	Palasapithia	1	1	1	1	0	0	0	0	0
52.	Renadapatana	1	1	1	0	0	0	0	0	0
53.	Balijhati	1	1	1	1	0	0	0	0	0
54.	Kainsiri	1	1	0	0	0	0	0	0	0
55.	Balipada	2	0	0	0	0	0	0	0	0
56.	Mathanuagan	1	1	1	0	0	0	0	0	0
57.	Kuninda	1	1	1	1	0	0	0	0	0
58.	Kendupada	1	1	1	0	0	0	0	0	0
59.	Hariamaru	2	0	0	0	0	0	0	0	0
60.	Baruan	1	1	1	1	1	1	0	0	0
61.	Dhalapada	1	1	1	1	0	0	0	0	0
62.	Kansaragoda	1	1	0	0	0	0	0	0	0
63.	Joragadia	2	0	0	0	0	0	0	0	0
64.	Maluagoda	1	1	0	0	0	0	0	0	0
65.	Khoksa(R)	1	1	0	0	0	0	0	0	0
66.	Kumurasinga	1	1	0	0	0	0	0	0	0
67.	Brahmankhantakhol	2	0	0	0	0	0	0	0	0
68.	Khoksa(L)	1	1	0	0	0	0	0	0	0
69.	Darjani	1	1	0	0	0	0	0	0	0
70.	Senanda	2	0	0	0	0	0	0	0	0
71.	Kankana	1	1	0	0	0	0	0	0	0
72.	Anala	1	1	1	1	0	0	0	0	0
73.	Odisha	1	1	1	1	0	0	0	0	0
74.	Koriapal	1	1	1	0	0	0	0	0	0
75.	Denga Bahali	1	1	0	0	0	0	0	0	0
76.	Krishnapur	1	1	0	0	0	0	0	0	0
77.	Sitalabasa	1	1	1	0	0	0	0	0	0
78.	Chandar	1	1	1	0	0	0	0	0	0

In Jajpur district:

Sl. No.	Village name.	Number of								
		Educational facilities	Primary School	Middle School	Secondary School	Senior Secondary School	College	Industrial School	Training School	Adult literacy
1.	Karadapal	1	1	0	0	0	0	0	0	0
2.	Uchabali	1	1	1	1	0	0	0	0	0
3.	Badabili	1	1	0	0	0	0	0	0	0
4.	Telibedha	1	1	1	0	0	0	0	0	0
5.	Kumbhanagara	1	1	0	0	0	0	0	0	0
6.	Gouda Bahali	2	0	0	0	0	0	0	0	0
7.	Santaragadia	1	1	0	0	0	0	0	0	0
8.	Tura	2	0	0	0	0	0	0	0	0
9.	Tarailo	1	1	1	0	0	0	0	0	0
10.	Nachhipura	1	1	1	1	0	0	0	0	0
11.	Kharadabandi	1	1	0	0	0	0	0	0	0
12.	Kabitra-	1	1	1	0	0	0	0	0	0
13.	Chitri	1	1	1	0	0	0	0	0	0
14.	Salijanga	1	1	1	1	0	0	0	0	0
15.	Godarapal	1	1	1	0	0	0	0	0	0
16.	Routpada	1	1	1	0	0	0	0	0	0
17.	Andhari	1	1	1	1	0	0	0	0	0
18.	Kadama	1	1	1	1	0	0	0	0	0
19.	Solabandi	1	1	1	1	0	0	0	0	0
20.	Asanjhar	1	1	1	0	0	0	0	0	0
21.	Kiapada	1	1	1	0	0	0	0	0	0
22.	Ranapur	1	1	1	1	0	0	0	0	0
23.	Gopalpur	1	1	0	0	0	0	0	0	0
24.	Raghupur	1	1	1	0	0	0	0	0	0
25.	Ragada	1	1	1	0	0	0	0	0	0
26.	Ramakrishnap	1	1	1	0	0	0	0	0	0
27.	Toranda	1	1	0	0	0	0	0	0	0
28.	Belada	2	0	0	0	0	0	0	0	0
29.	Mahulia	1	1	1	0	0	0	0	0	0
30.	Paramanandap	1	1	1	0	0	0	0	0	0
31.	Aranto	2	0	0	0	0	0	0	0	0
32.	Ragadi	1	1	1	0	0	0	0	0	0
33.	Patarakana	1	1	1	1	0	0	0	0	0
34.	Sampur	1	1	1	0	0	0	0	0	0
35.	Sanla	1	1	0	0	0	0	0	0	0

36.	Korabandi	1	1	1	0	0	0	0	0	0
37.	Kacharasahi	1	1	1	1	0	0	0	0	0
38.	Bachhipur	1	1	0	0	0	0	0	0	0
39.	Sitalgobindapu	1	1	0	0	0	0	0	0	0
40.	Pachhikote	1	1	1	0	0	0	0	0	0
41.	Chingudipur	2	0	0	0	0	0	0	0	0
42.	Sunachara	2	0	0	0	0	0	0	0	0
43.	Jugala	1	1	1	0	0	0	0	0	0
44.	Nayahatpatna	1	1	1	0	0	0	0	0	0
45.	Mathurapur	1	1	1	0	0	0	0	0	0
46.	Mukundapur	1	1	1	1	0	0	0	0	0
47.	Kantore	1	1	1	1	0	0	0	0	0
48.	Gajendrapur	1	1	0	0	0	0	0	0	0
49.	Nishankhapur	1	1	0	0	0	0	0	0	0
50.	Ranagundi	1	1	0	0	0	0	0	0	0
51.	Tulasipur	1	1	1	1	0	0	0	0	0
52.	Gourpur	1	1	0	0	0	0	0	0	0
53.	Jugalakana	1	1	0	0	0	0	0	0	0
54.	Mangalpur	1	1	1	1	0	0	0	0	0
55.	Sulia	1	1	1	1	0	0	0	0	0
56.	Sahaspur	1	1	1	0	0	0	0	0	0
57.	Barakhai	1	1	1	1	0	0	0	0	0
58.	Baliapal	1	1	1	0	0	0	0	0	0
59.	Purbakote	1	1	1	0	0	0	0	0	0
60.	Khosalpur	2	0	0	0	0	0	0	0	0
61.	Narendrabhog	2	0	0	0	0	0	0	0	0
62.	Manjuri	1	1	1	1	0	0	0	0	0
63.	Talia	2	0	0	0	0	0	0	0	0
64.	Gohiragadia	1	1	1	1	0	0	0	0	0
65.	Asanagadia	1	1	1	1	0	0	0	0	0
66.	Mulasar	1	1	1	0	0	0	0	0	0
67.	Gayalgadia	1	1	1	1	0	0	0	0	0
68.	Biridiha	1	1	1	0	0	0	0	0	0
69.	Barahampur	1	1	0	0	0	0	0	0	0
70.	Sanasahaspur	2	0	0	0	0	0	0	0	0
71.	Solapatia	1	1	1	0	0	0	0	0	0
72.	Gamharia	1	1	1	0	0	0	0	0	0
73.	Khamigan	1	1	1	1	0	0	0	0	0
74.	Jalanda	1	1	1	0	0	0	0	0	0
75.	Oshala	1	1	1	1	0	0	0	0	0
76.	Rampilo	1	1	1	1	0	0	1	0	0
77.	Godigotha	1	1	0	0	0	0	0	0	0
78.	Ichhapur	1	1	1	1	0	0	0	0	0
79.	Nadia Bhanga	1	1	1	1	0	0	0	0	0

80.	Bainsipur	2	0	0	0	0	0	0	0	0
81.	Jaintira	2	0	0	0	0	0	0	0	0
82.	Aranyamadana	1	1	0	0	0	0	0	0	0
83.	Mandapada	2	0	0	0	0	0	0	0	0
84.	Pataranga	1	1	1	0	0	0	0	0	0
85.	Jalapatipur	2	0	0	0	0	0	0	0	0
86.	Pimpudia	1	1	1	1	0	0	0	0	0
87.	Sahagan	1	1	0	0	0	0	0	0	0
88.	Uttarkota	2	0	0	0	0	0	0	0	0
89.	Kayan	1	1	0	0	0	0	0	0	0
90.	Talagadia	1	1	1	1	0	0	0	0	0
91.	Biruanpada	1	1	1	0	0	0	0	0	0
92.	Mangarajpur	1	1	0	0	0	0	0	0	0
93.	Uttarakhajira	1	1	0	0	0	0	0	0	0
94.	Kantapal	1	1	0	0	0	0	0	0	0
95.	Baragadia	1	1	1	1	0	0	0	0	0
96.	Ambapal	2	0	0	0	0	0	0	0	0
97.	Nigodha	1	1	0	0	0	0	0	0	0
98.	Chhanchania	2	0	0	0	0	0	0	0	0
99.	Sansailo	1	1	1	1	0	0	0	0	0
100.	Gorakhapur	2	0	0	0	0	0	0	0	0
101.	Pandiapada	2	0	0	0	0	0	0	0	0
102.	Khaira	1	1	0	0	0	0	0	0	0
103.	Upulei	1	1	1	0	0	0	0	0	0
104.	Harichandpur	2	0	0	0	0	0	0	0	0
105.	Bandalo	1	1	1	1	0	0	0	0	0
106.	Jagulaigadia	1	1	1	0	0	0	0	0	0
107.	Sarangapur	1	1	1	0	0	0	0	0	0
108.	Nuadihi	1	1	1	0	0	0	0	0	0
109.	Ollala	1	1	1	1	0	0	0	0	0
110.	Jhatiasahi	2	0	0	0	0	0	0	0	0
111.	Kankadajhar	1	1	1	0	0	0	0	0	0
112.	Duburi	1	1	1	1	1	1	0	0	0
113.	Uparagarh	2	0	0	0	0	0	0	0	0
114.	Talagarh	1	1	1	0	0	0	0	0	0
115.	Santasahi	1	1	1	0	0	0	0	0	0
116.	Bandhagan	1	1	1	1	0	0	0	0	0
117.	Kaduabandi	1	1	1	0	0	0	0	0	0
118.	Saransa	2	0	0	0	0	0	0	0	0
119.	Khajurinalua	1	1	1	0	0	0	0	0	0
120.	Gobaragali	2	0	0	0	0	0	0	0	0
121.	Gopinathpur	2	0	0	0	0	0	0	0	0
122.	Tulati	1	1	1	1	0	0	0	0	0
123.	Khajuribindha	2	0	0	0	0	0	0	0	0

124.	Bangarkote	1	1	0	0	0	0	0	0	0
125.	Pimpal	1	1	0	0	0	0	0	0	0
126.	Kaliapal	2	0	0	0	0	0	0	0	0
127.	Garamian	1	1	1	1	0	0	0	0	0
128.	Jalanda	1	1	1	0	0	0	0	0	0
129.	Galiachhanda	1	1	0	0	0	0	0	0	0
130.	Mantira	1	1	0	0	0	0	0	0	0
131.	Raghunathpur	2	0	0	0	0	0	0	0	0
132.	Arjunjhar	2	0	0	0	0	0	0	0	0
133.	Hatapur	1	1	0	0	0	0	0	0	0
134.	Tarakote	1	1	1	1	0	0	0	0	0
135.	Barundai	1	1	1	1	1	1	0	0	0
136.	Gahira Patuli	1	1	1	0	0	0	0	0	0
137.	Sundarapokhar	1	1	0	0	0	0	0	0	0
138.	Rahemanpur	2	0	0	0	0	0	0	0	0
139.	Akhanpur	2	0	0	0	0	0	0	0	0
140.	Baragaji	2	0	0	0	0	0	0	0	0
141.	Routapada	1	1	0	0	0	0	0	0	0
142.	Kantipur	1	1	0	0	0	0	0	0	0
143.	Madhapur	1	1	0	0	0	0	0	0	0
144.	Kusumundia	1	1	0	0	0	0	0	0	0
145.	Gantayatkateni	1	1	0	0	0	0	0	0	0
146.	Gandhapal	1	1	1	0	0	0	0	0	0
147.	Nandakishor	1	1	1	1	0	0	0	0	0
148.	Ashokjhar	1	1	0	0	0	0	0	0	0
149.	Hatpur	1	1	0	0	0	0	0	0	0
150.	Dhapanki	1	1	0	0	0	0	0	0	0
151.	Mangobindapu	1	2	2	1	0	0	0	0	0
152.	Kogan	1	1	1	0	0	0	0	0	0
153.	Haladigadia	1	1	1	1	0	0	0	0	0
154.	Kankadagadia	2	0	0	0	0	0	0	0	0
155.	Bhalunkipatala	1	1	1	0	0	0	0	0	0
156.	Mohammadhos	1	1	0	0	0	0	0	0	0
157.	Itapur	2	0	0	0	0	0	0	0	0
158.	Bhatasolapat	1	1	1	0	0	0	0	0	0
159.	Bagira	2	0	0	0	0	0	0	0	0
160.	Jhumpan	2	0	0	0	0	0	0	0	0
161.	Salaba	1	1	0	0	0	0	0	0	0
162.	Kuhika	1	1	1	1	0	0	0	0	0
163.	Dhuligarh	1	2	0	0	0	0	0	0	0
164.	Dudhajori	1	1	0	0	0	0	0	0	0
165.	Naguan	1	1	1	0	0	0	0	0	0
166.	Padi	1	1	0	0	0	0	0	0	0
167.	Draupadipur	2	0	0	0	0	0	0	0	0

168.	Tarapada	1	1	0	0	0	0	0	0	0
169.	Nuagan	1	1	0	0	0	0	0	0	0
170.	Amrutia	1	1	1	1	0	0	0	0	0
171.	Taharpur	1	1	1	1	0	0	0	0	0
172.	Nayagarh	2	0	0	0	0	0	0	0	0
173.	Sarasada	1	1	1	0	0	0	0	0	0
174.	Salakana	1	1	1	0	0	0	0	0	0
175.	Ranipada	1	1	1	1	0	0	0	0	0
176.	Barigodha	2	0	0	0	0	0	0	0	0
177.	Hatimunda	2	0	0	0	0	0	0	0	0
178.	Kandaragadia	2	0	0	0	0	0	0	0	0
179.	Olia	1	1	0	0	0	0	0	0	0
180.	Mulakhamba	1	1	0	0	0	0	0	0	0
181.	Khurunti	1	1	1	1	0	0	0	0	0
182.	Santarapur	1	1	0	0	0	0	0	0	0
183.	Banahara	2	0	0	0	0	0	0	0	0
184.	Sainto	1	1	0	0	0	0	0	0	0
185.	Kankadapal	1	1	1	0	0	0	0	0	0
186.	Gobara Ghati	1	3	2	1	0	0	0	0	0
187.	Sisua	1	1	0	0	0	0	0	0	0
188.	Abhayapur	1	1	1	0	0	0	0	0	0
189.	Banhara	1	1	0	0	0	0	0	0	0
190.	Mulasaragada	1	1	1	1	0	0	0	0	0
191.	Bantala	1	1	0	0	0	0	0	0	0
192.	Fazalpur	1	1	1	1	0	0	0	0	0
193.	Rangaranga	1	1	1	1	0	0	0	0	0
194.	Khilipankha	1	1	1	0	0	0	0	0	0
195.	Nizigarh	1	2	1	1	1	1	0	0	0
196.	Kuanrada	2	0	0	0	0	0	0	0	0
197.	Gadapur	1	1	0	0	0	0	0	0	0
198.	Chandia	1	1	0	0	0	0	0	0	0
199.	Brahmanda	1	1	1	1	0	0	0	0	0
200.	Bambilo	1	1	1	0	0	0	0	0	0
201.	Khiro	1	1	0	0	0	0	0	0	0
202.	Barada	1	1	0	0	0	0	0	0	0
203.	Panasua	2	0	0	0	0	0	0	0	0
204.	Chandma	2	0	0	0	0	0	0	0	0
205.	Danagadi	1	1	1	0	0	0	0	0	0
206.	Mangalpur	1	1	1	1	0	0	0	0	0
207.	Sukarana	1	1	0	0	0	0	0	0	0
208.	Aladajalasarpu	1	1	1	0	0	0	0	0	0
209.	Jaintala	1	1	0	0	0	0	0	0	0
210.	Barapal	2	0	0	0	0	0	0	0	0
211.	Damodar pur	1	1	1	1	0	0	0	0	0

212.	Palasa	1	1	0	0	0	0	0	0	0
213.	Sadakpur	1	1	0	0	0	0	0	0	0
214.	Charada	1	1	0	0	0	0	0	0	0
215.	Dhantri	1	1	1	1	0	0	0	0	0
216.	Ranasarapur	1	1	0	0	0	0	0	0	0
217.	Baladia	2	0	0	0	0	0	0	0	0
218.	Jamupasi	1	1	0	0	0	0	0	0	0
219.	Bhakandari	1	1	1	0	0	0	0	0	0
220.	Baghanata	2	0	0	0	0	0	0	0	0
221.	Kanchichua	2	0	0	0	0	0	0	0	0
222.	Kharajabatira	1	1	1	0	0	0	0	0	0
223.	Mangal Pur	1	1	1	0	0	0	0	0	0
224.	Adhagan	1	1	0	0	0	0	0	0	0
225.	Bartamana	1	1	0	0	0	0	0	0	0
226.	Mrutunjayapur	1	1	0	0	0	0	0	0	0
227.	Depada	2	0	0	0	0	0	0	0	0
228.	Nuagan	1	1	0	0	0	0	0	0	0
229.	Tentulikhunta	1	1	0	0	0	0	0	0	0
230.	Ranigoda	1	1	0	0	0	0	0	0	0
231.	Gobindapur	2	0	0	0	0	0	0	0	0
232.	Mirigi Chara	1	1	0	0	0	0	0	0	0
233.	Dandkiri	1	1	0	0	0	0	0	0	0
234.	Sata Bainsia	2	0	0	0	0	0	0	0	0
235.	Badapatuli	1	1	1	0	0	0	0	0	0
236.	Pubal	1	1	0	0	0	0	0	0	0
237.	Jakha Pura	1	1	1	1	0	0	0	0	0
238.	Ochinda	1	1	1	0	0	0	0	0	0
239.	Dhaneswar	1	1	1	1	0	0	0	0	0
240.	Santarapur	1	1	0	0	0	0	0	0	0
241.	Ampolaba	1	1	1	1	0	0	0	0	0
242.	Ankura Pal	1	1	0	0	0	0	0	0	0
243.	Botalanda	1	1	1	0	0	0	0	0	0
244.	Ranapal	1	1	1	0	0	0	0	0	0
245.	Khaira dihi	1	1	0	0	0	0	0	0	0
246.	Kacheri Gan	2	0	0	0	0	0	0	0	0
247.	Begana	1	1	1	1	0	0	0	0	0
248.	Chillipada	1	1	0	0	0	0	0	0	0
249.	Sanapatuli	1	1	1	0	0	0	0	0	0
250.	Gunduchi pasi	1	1	0	0	0	0	0	0	0
251.	Baradhi	1	1	0	0	0	0	0	0	0
252.	Mulari	2	0	0	0	0	0	0	0	0
253.	Karada	1	1	1	1	0	0	0	0	0
254.	Khosalapur	2	0	0	0	0	0	0	0	0
255.	Barapada	1	1	0	0	0	0	0	0	0

256.	Balunga Bandi	1	1	0	0	0	0	0	0	0
257.	Taja Pur	2	0	0	0	0	0	0	0	0
258.	Golagan	1	1	1	1	0	0	0	0	0
259.	Benapur	2	0	0	0	0	0	0	0	0
260.	Dhanapur	1	1	1	0	0	0	0	0	0
261.	Khasa Gadia	2	0	0	0	0	0	0	0	0
262.	Brajanagar	1	1	0	0	0	0	0	0	0
263.	Balipasi	2	0	0	0	0	0	0	0	0
264.	Sathipur	1	1	1	0	0	0	0	0	0
265.	Mulapal	1	1	1	0	0	0	0	0	0
266.	Kharadi	1	1	1	1	0	0	0	0	0
267.	Bada barunei	2	0	0	0	0	0	0	0	0
268.	Bharada Pasi	2	0	0	0	0	0	0	0	0
269.	Janha	1	1	1	1	0	0	0	0	0
270.	Talugan	1	1	0	0	0	0	0	0	0
271.	Alia	2	0	0	0	0	0	0	0	0
272.	Pathara Pada	1	1	0	0	0	0	0	0	0
273.	Taluri	2	0	0	0	0	0	0	0	0
274.	Dasamania	2	0	0	0	0	0	0	0	0
275.	Badsulidihi	1	1	0	0	0	0	0	0	0
276.	Rachhi Pur	1	1	1	1	0	0	0	0	0
277.	Chhotara Pur	1	1	1	0	0	0	0	0	0
278.	Nuapada	1		0	0	0	0	0	0	0
279.	Ambasara	1	1	1	0	0	0	0	0	0
280.	Rudhia	1	1	1	1	0	0	0	0	0
281.	Manatira	1	2	1	1	1	1	0	0	0
282.	Karada pal	1	1	1	0	0	0	0	0	0
283.	Oupada	2	0	0	0	0	0	0	0	0
284.	Nimapali	1	1	1	0	0	0	0	0	0
285.	Janha Kana	1	1	0	0	0	0	0	0	0
286.	Tailada	2	0	0	0	0	0	0	0	0
287.	Bajarapada	2	0	0	0	0	0	0	0	0
288.	Mohammed	2	0	0	0	0	0	0	0	0
289.	Bairimal	1	1	1	1	0	0	0	0	0
290.	Raitikara	1	1	0	0	0	0	0	0	0
291.	Alatiri	1	1	1	1	0	0	0	0	0
292.	Kantigadia	1	1	1	0	0	0	0	0	0
293.	Khaira Bad	1	1	0	0	0	0	0	0	0
294.	Nara Pada	1	1	1	0	0	0	0	0	0
295.	Kuru Pada	1	1	1	0	0	0	0	0	0
296.	Rabana	1	1	1	0	0	0	0	0	0
297.	Panikoili	1	1	0	0	0	0	0	0	0
298.	Radhanagar	1	1	0	0	0	0	0	0	0
299.	Farti Pur	2	0	0	0	0	0	0	0	0

300.	Malanandapur	1	1	1	1	0	0	0	0	0
301.	Marutikar	1	1	0	0	0	0	0	0	0
302.	Damodara Pur	1	1	1	0	0	0	0	0	0
303.	Bhiki Pur	1	1	1	0	0	0	0	0	0
304.	Manohar Pur	1	1	1	0	0	0	0	0	0
305.	Dania Bar	1	1	0	0	0	0	0	0	0
306.	Badhei Tikar	1	1	0	0	0	0	0	0	0
307.	Hetagadia	2	0	0	0	0	0	0	0	0
308.	Soti	1	1	1		0	0	0	0	0
309.	Hatibari	1	1	1	1	0	0	0	0	0
310.	Namatikiri	1	1	1	0	0	0	0	0	0
311.	Balipasi	1	1	0	0	0	0	0	0	0
312.	Balia Posi	1	1	0	0	0	0	0	0	0
313.	Brahman Bad	1	1	0	0	0	0	0	0	0
314.	Khaman	1	4	2	1	0	0	0	0	0
315.	Pahanga	2	0	0	0	0	0	0	0	0
316.	Nahanda	1	1	0	0	0	0	0	0	0
317.	Pankapal	2	0	0	0	0	0	0	0	0
318.	Manipur	1	1	0	0	0	0	0	0	0
319.	Matabad	1	1	1	0	0	0	0	0	0
320.	Kumbhirigadia	1	1	1	1	0	0	0	0	0
321.	Chhatra Kana	1	1	0	0	0	0	0	0	0
322.	Krushnnagar	1	1	1	0	0	0	0	0	0
323.	Jagadhi	1	1	0	0	0	0	0	0	0
324.	Kaitha	1	1	1	0	0	0	0	0	0
325.	Krushnanagar	2	0	0	0	0	0	0	0	0
326.	Laxmi Nagar	1	1	1	1	0	0	0	0	0
327.	Gotutha	2	0	0	0	0	0	0	0	0
328.	Sana Pingal	1	1	1	0	0	0	0	0	0
329.	Bada Pingal	1	1	1	1	0	0	0	0	0
330.	Tara Pur	1	1	1	0	0	0	0	0	0
331.	Sala Pada	2	0	0	0	0	0	0	0	0
332.	Martha Pur	2	0	0	0	0	0	0	0	0
333.	Solapatta	1	1	1	0	0	0	0	0	0
334.	Balarampur	2	0	0	0	0	0	0	0	0
335.	Naudapur	1	1	0	0	0	0	0	0	0
336.	Nilamanidei	1	1	1	1	0	0	0	0	0
337.	Brahmangan	1	1	0	0	0	0	0	0	0
338.	Khajuri Pur	1	1	0	0	0	0	0	0	0
339.	Jokadia	1	1	0	0	0	0	0	0	0
340.	Khapuria Pada	1	1	1	1	0	0	0	0	0
341.	Rampur Sagadi	2	0	0	0	0	0	0	0	0
342.	Nuapatna	1	1	0	0	0	0	0	0	0
343.	Balipasi	1	1	0	0	0	0	0	0	0

344.	Jalaka	2	0	0	0	0	0	0	0	0
345.	Khandara Pur	2	0	0	0	0	0	0	0	0
346.	Radhanagar	1	1	0	0	0	0	0	0	0
347.	Chakua	1	1	1	0	0	0	0	0	0
348.	Goleipur	1	2	1	1	0	0	0	0	0
349.	Mirjapur	2	0	0	0	0	0	0	0	0
350.	Badabiruan	1	3	2	1	0	0	0	0	0
351.	Damodar pur	1	1	1	1	0	0	0	0	0
352.	Godipatana	1	1	0	0	0	0	0	0	0
353.	Atta	1	2	2	1	0	0	0	0	0
354.	Benga madha	2	0	0	0	0	0	0	0	0
355.	Rautara Pur	1	1	1	0	0	0	0	0	0
356.	Telia	1	1	0	0	0	0	0	0	0
357.	Jemadeipur	1	1	0	0	0	0	0	0	0
358.	Haripur	1	2	2	1	0	0	0	0	0
359.	Ambatola	2	0	0	0	0	0	0	0	0
360.	Sana Biruan	1	1	0	0	0	0	0	0	0
361.	Mangaraj Pur	1	1	1	0	0	0	0	0	0
362.	Banamali Pur	2	0	0	0	0	0	0	0	0
363.	Kantira	1	1	0	0	0	0	0	0	0
364.	Bahabalpur	1	1	1	0	0	0	0	0	0
365.	Banja	1	1	1	1	0	0	0	0	0
366.	Bartanda	1	1	1	1	0	0	0	0	0
367.	Solapur	1	1	1	0	0	0	0	0	0
368.	Kumudi	2	0	0	0	0	0	0	0	0
369.	Mangalpur	1	1	1	1	0	0	0	0	0
370.	Santra	1	1	0	0	0	0	0	0	0

In KEONJHAR District:

Sl No.	Village name	Number of								
		Educational facilities	Primary School	Middle School	Secondary School	Senior Secondary School	College	Industrial School	Training School	Adult literacy
1.	Kodapada	1	1	1	1	0	0	0	0	0
2.	Beladiha	2	0	0	0	0	0	0	0	0
3.	Biragobindapur	1	1	1	1	0	0	0	0	0
4.	Gohirabani	1	1	0	0	0	0	0	0	0
5.	Talagaon	1	1	1	1	0	0	0	0	0
6.	Sadangi	1	1	1	1	1	1	0	0	0
7.	Gohira	1	1	1	1	0	0	0	0	0
8.	Palaspur	2	0	0	0	0	0	0	0	0
9.	Kumunia	1	1	0	0	0	0	0	0	0
10.	Indupura	1	1	0	0	0	0	0	0	0
11.	Anandapur Alias Panchapokharia	1	1	1	0	0	0	0	0	0
12.	Kainpura	1	1	1	0	0	0	0	0	0
13.	Jhadakhundi	1	1	0	0	0	0	0	0	0
14.	Chamuhin	1	1	0	0	0	0	0	0	0
15.	Surhusuria	1	1	1	0	0	0	0	0	0
16.	Naduan	1	1	1	0	0	0	0	0	0
17.	Vatisira	1	1	1	0	0	0	0	0	0
18.	Tukuna	1	1	1	1	1	1	0	0	0
19.	Balarampur	1	1	1	1	0	0	0	0	0
20.	Bancho	1	3	2	1	0	0	0	0	0
21.	Naduan	1	1	1	0	0	0	0	0	0
22.	Bailo	1	1	1	1	0	0	0	0	0
23.	Guhalia	2	0	0	0	0	0	0	0	0
24.	Nuapada	1	1	0	0	0	0	0	0	0
25.	Banika	1	1	0	0	0	0	0	0	0
26.	Khadibil	1	1	0	0	0	0	0	0	0
27.	Purunian	1	1	1	0	0	0	0	0	0
28.	Barigaon	1	1	0	0	0	0	0	0	0
29.	Hatibandha	1	1	1	0	0	0	0	0	0
30.	Panchupali	1	3	2	1	0	0	0	0	0
31.	Sibanarayanpur	1	1	1	1	0	0	0	0	0
32.	Atasahipatana	1	1	0	0	0	0	0	0	0

33.	Atasahi	1	1	1	1	0	0	0	0	0
34.	Sarei	1	1	0	0	0	0	0	0	0
35.	Hatisila	1	1	0	0	0	0	0	0	0
36.	Kochianendi	1	1	0	0	1	1	0	0	0
37.	Satatira	1	1	0	0	0	0	0	0	0
38.	Raghabpur	1	1	0	0	0	0	0	0	0
39.	Belabhali	1	1	1	1	1	1	0	0	0
40.	Deogaon	1	1	0	0	0	0	0	0	0
41.	Adghuria	1	1	0	0	0	0	0	0	0
42.	Bhaganai	1	1	1	0	0	0	0	0	0
43.	Tolankapada	1	1	1	1	0	0	0	0	0
44.	Kanpur	1	1	1	1	0	0	0	0	0
45.	Dipapal	1	1	0	0	0	0	0	0	0
46.	Hasanpur	1	1	0	0	0	0	0	0	0
47.	Dhinkia	1	1	0	0	0	0	0	0	0
48.	Hirapur	2	0	0	0	0	0	0	0	0
49.	Siapada	1	1	0	0	0	0	0	0	0
50.	Mangalpur	1	1	0	0	0	0	0	0	0
51.	Sahanadpur	2	0	0	0	0	0	0	0	0
52.	Mugupur	1	1	1	1	0	0	0	0	0
53.	Haridapal	1	1	0	0	0	0	0	0	0
54.	Tikara	2	0	0	0	0	0	0	0	0
55.	Madanpur	1	1	1	1	0	0	0	0	0
56.	Godipatna	1	1	0	0	0	0	0	0	0
57.	Paikchatra	1	1	0	0	0	0	0	0	0
58.	Jalasuan	1	1	1	0	0	0	0	0	0
59.	Karadapal	1	1	0	0	0	0	0	0	0
60.	Tarava	1	1	1	1	0	0	0	0	0
61.	Naukana	2	0	0	0	0	0	0	0	0
62.	Bamphidi	1	1	1	0	0	0	0	0	0
63.	Rudranarayanpur	1	1	0	0	0	0	0	0	0
64.	Nayagarh	1	1	1	1	0	0	0	0	0
65.	Machhalo	1	1	1	1	0	0	0	0	0
66.	Pandua	1	1	1	1	0	0	0	0	0
67.	Bato	1	1	1	1	1	1	0	0	0
68.	Ambo	1	1	1	1	0	0	0	0	0
69.	Pahadpur	1	1	1	1	0	0	0	0	0
70.	Paramandapur	1	1	0	0	0	0	0	0	0
71.	Panchara	1	1	1	0	0	0	0	0	0
72.	Sainkul	1	2	2	1	1	1	0	0	0
73.	Tampo	1	1	0	0	0	0	0	0	0
74.	Patilo	1	1	1	0	0	0	0	0	0
75.	Khadikasulabahali	1	1	0	0	0	0	0	0	0
76.	Kothasahi	2	0	0	0	0	0	0	0	0
77.	Anjira	2	0	0	0	0	0	0	0	0

78.	Fatepur	2	0	0	0	0	0	0	0	0
79.	Khalana	1	1	1	1	0	0	0	0	0
80.	Dantia	1	1	1	1	0	0	0	0	0
81.	Agarda	1	1	0	0	0	0	0	0	0
82.	Nuagaon	1	1	1	1	0	0	0	0	0
83.	Madhukesari	1	1	1	0	0	0	0	0	0
84.	Jenapada	1	1	0	0	0	0	0	0	0
85.	Dihakatina	1	1	1	0	0	0	0	0	0
86.	Dantia	1	1	1	1	0	0	0	0	0
87.	Garhbandhogoda	1	1	1	1	0	0	0	0	0
88.	Patilo	1	1	0	0	0	0	0	0	0
89.	Gobargali	1	1	0	0	0	0	0	0	0
90.	Gainthagodi	2	0	0	0	0	0	0	0	0
91.	Atta	1	1	1	1	0	0	0	0	0
92.	Kainsiari	2	0	0	0	0	0	0	0	0
93.	Ullol	1	1	1	0	0	0	0	0	0
94.	Lunahar	1	1	1	0	0	0	0	0	0
95.	Patasura	1	1	1	0	0	0	0	0	0
96.	Mangalagadia	2	0	0	0	0	0	0	0	0
97.	Girigaon	1	1	1	1	0	0	0	0	0
98.	Kantabania	1	1	1	0	0	0	0	0	0
99.	Krushnapur	1	1	1	0	0	0	0	0	0
100.	Chandali	1	1	1	0	0	0	0	0	0
101.	Belada	1	1	0	0	0	0	0	0	0
102.	Baharipur	1	1	1	1	0	0	0	0	0
103.	Jarak	2	0	0	0	0	0	0	0	0
104.	Sanapadana	2	0	0	0	0	0	0	0	0
105.	Bahugadia	2	0	0	0	0	0	0	0	0
106.	Haripur	1	1	0	0	0	0	0	0	0
107.	Baniapasi	1	1	1	0	0	0	0	0	0
108.	Bramhanda	2	0	0	0	0	0	0	0	0
109.	Suanlo	1	1	1	0	0	0	0	0	0
110.	Suanpada	1	1	1	0	0	0	0	0	0
111.	Valuka	2	0	0	0	0	0	0	0	0
112.	Napanga	1	1	0	0	0	0	0	0	0
113.	Mahuri	1	1	1	1	0	0	0	0	0
114.	Ujuni	1	1	0	0	0	0	0	0	0
115.	Taruan	1	1	1	1	0	0	0	0	0
116.	Balibaruan	1	1	1	1	0	0	0	0	0
117.	Bhandaripada	2	0	0	0	0	0	0	0	0
118.	Raitola	1	1	1	0	0	0	0	0	0
119.	Kaithapatna	1	1	0	0	0	0	0	0	0
120.	Padanpur	1	1	0	0	0	0	0	0	0
121.	Badapadana	1	1	1	1	0	0	0	0	0

122.	Padanpur	1	1	0	0	0	0	0	0	0
123.	Saladei	1	1	1	1	0	0	0	0	0
124.	Alati	1	1	1	1	0	0	0	0	0
125.	Kendukhunta	1	1	1	1	0	0	0	0	0
126.	Samana	1	2	1	0	0	0	0	0	0
127.	Karadamali	1	1	0	0	0	0	0	0	0
128.	Belasundari	1	1	1	0	0	0	0	0	0
129.	Gudiadihi	1	1	0	0	0	0	0	0	0
130.	Ramachandrapur	2	0	0	0	0	0	0	0	0
131.	Narda	1	1	0	0	0	0	0	0	0
132.	Janardanpurpatna	1	1	0	0	0	0	0	0	0
133.	Aligaon	1	1	0	0	0	0	0	0	0
134.	Tigiria	1	1	0	0	0	0	0	0	0
135.	Odapada	1	1	1	0	0	0	0	0	0
136.	Purunabandhogod	1	1	1	1	0	0	0	0	0
137.	Angarua	1	1	1	0	0	0	0	0	0
138.	Jarda	1	1	1	0	0	0	0	0	0
139.	Nahangi	1	1	0	0	0	0	0	0	0
140.	Katenikantal	2	0	0	0	0	0	0	0	0
141.	Sainpal	2	0	0	0	0	0	0	0	0
142.	Bilabandha	2	0	0	0	0	0	0	0	0
143.	Gobindapur	1	1	0	0	0	0	0	0	0
144.	Guhaldihi	2	0	0	0	0	0	0	0	0
145.	Karadapal	1	1	0	0	0	0	0	0	0
146.	Ganpur	1	1	1	1	0	0	0	0	0
147.	Nandabar	1	1	1	0	0	0	0	0	0
148.	Beguniadihi	1	1	0	0	0	0	0	0	0
149.	Kolipal	1	1	0	0	0	0	0	0	0
150.	Nuhamalia	1	1	1	0	0	0	0	0	0
151.	Baranga	1	1	1	0	0	0	0	0	0
152.	Mala	1	1	1	1	0	0	0	0	0
153.	Krushnapur	1	1	1	0	0	0	0	0	0
154.	Shalaparha	2	0	0	0	0	0	0	0	0

Medical facilities in Dhenkanal District

Sl. No.	Village name	Number of													
		Hospital				Dispensary									
		Allopathic	Ayurvedic	Unani	Homeopathic	Allopathic	Ayurvedic	Unani	Homeopathic	Maternity and Child Welfare	Child Welfare Centre	Health Centre	Primary Health Centre	Primary Health Sub Centre	Family welfare Centre
1.	Kanapalsamilmahulpal	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2.	Ekatali(Kha)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
3.	Mrudanga	0	0	0	0	0	0	0	0	0	0	0	1	0	0
4.	Kingol	0	0	0	0	0	0	0	1	0	0	0	0	1	0
5.	Surapratappur	0	0	0	0	0	0	0	0	0	0	0	0	1	0
6.	Balibo(L)	0	0	0	0	0	0	0	0	0	0	0	0	2	0
7.	Garhnrusinghaprasad	0	0	0	0	0	0	0	0	0	0	0	0	1	0
8.	Dayanabili	0	0	0	0	0	0	0	0	0	0	0	0	1	0
9.	Baruan	0	0	0	0	0	0	0	0	0	0	0	1	1	0
10.	Dhalapada	0	0	0	0	0	0	0	1	0	0	0	0	1	0
11.	Anala	0	0	0	0	0	1	0	0	0	0	0	0	0	0
12.	Odisha	0	0	0	0	0	0	0	0	0	0	0	1	0	0

In JAJPUR District:

Sl. No.	Name of the village.	Number of											
		Hospital				Dispensary							
		Allopathic	Ayurvedic	Unani	Homeopathic	Allopathic	Ayurvedic	Unani	Homeopathic	Maternity and Child Welfare Centre	Child Welfare Centre	Health Centre	Primary Health Centre
1.	Pachhikote	0	0	0	0	0	1	0	0	0	0	0	1
2.	Rampilo	0	0	0	0	0	0	0	1	0	0	0	0
3.	Upulei	0	0	0	0	0	0	0	1	0	0	0	0
4.	Bandalo	0	0	0	0	0	0	0	0	0	0	0	1
5.	Duburi	0	0	0	0	0	0	0	0	0	0	0	1
6.	Barundai	0	0	0	0	0	0	0	0	0	1	0	1
7.	Kuhika	0	0	0	0	0	0	0	0	0	0	0	1
8.	Kankadapal	0	0	0	0	0	1	0	0	0	0	0	0
9.	Nizigarh	0	0	0	0	0	0	0	0	0	1	0	1
10.	Jakha Pura	0	0	0	0	0	0	0	0	0	0	0	1
11.	Manatira	0	0	0	0	0	1	0	0	0	0	0	0
12.	Rabana	0	0	0	0	0	0	0	0	0	0	0	1
13.	Panikoili	0	0	0	0	0	0	0	0	0	0	0	1
14.	Hatibari	0	0	0	0	0	1	0	0	0	0	0	1
15.	Kumbhirigadia	0	0	0	0	0	0	0	1	0	0	0	0
16.	Laxmi Nagar	0	0	0	0	0	0	0	0	0	0	0	1
17.	Atta	0	0	0	0	0	0	0	0	0	0	0	1

In KEONJHAR District

Sl. No.	Name of the village.	Number of													
		Hospital				Dispensary									
		Allopathic	Ayurvedic	Unani	Homeopathic	Allopathic	Ayurvedic	Unani	Homeopathic	Maternity and Child Welfare Centre	Child Welfare Centre	Health Centre	Primary Health Centre	Primary Health Sub Centre	Family Welfare Centre
1.	Kodapada	0	0	0	0	0	0	0	1	0	0	0	0	1	0
2.	Sadangi	0	0	0	0	0	0	0	1	0	0	0	0	1	0
3.	Gohira	0	0	0	0	0	0	0	0	0	0	0	0	1	0
4.	Balarampur	0	0	0	0	0	0	0	0	0	0	0	0	1	0
5.	Bancho	0	0	0	0	0	1	0	0	0	0	0	0	0	0
6.	Bailo	0	0	0	0	0	0	0	0	0	0	0	0	1	0
7.	Panchupali	0	0	0	0	0	0	0	0	0	0	0	1	1	0
8.	Sibanarayanpur	0	0	0	0	0	1	0	0	0	0	0	0	1	0
9.	Atasahi	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10.	Belabhali	0	0	0	0	0	1	0	0	0	0	0	0	1	0
11.	Tolankapada	0	0	0	0	0	0	0	0	0	0	0	0	1	0
12.	Mugupur	0	0	0	0	0	0	0	0	0	0	0	1	0	0
13.	Haridapal	0	0	0	0	0	0	0	0	0	0	0	0	1	0
14.	Madanpur	0	0	0	0	0	0	0	0	0	0	0	0	1	0
15.	Nayagarh	0	0	0	0	0	0	0	0	0	0	0	0	1	0
16.	Machhalo	0	0	0	0	0	0	0	0	0	0	0	0	1	0
17.	Bato	0	0	0	0	0	0	0	0	0	0	0	1	1	0
18.	Ambo	0	0	0	0	0	0	0	0	0	0	0	0	1	0
19.	Sainkul	0	0	0	0	0	0	0	0	0	1	1	0	0	1
20.	Patilo	0	0	0	0	0	0	0	1	0	0	0	0	1	0
21.	Garhbandhogod	0	0	0	0	0	0	0	1	0	0	0	0	1	0
22.	Atta	0	0	0	0	0	0	0	0	0	0	0	0	1	0
23.	Girigaon	0	0	0	0	0	1	0	0	0	0	0	0	1	0
24.	Krushnapur	0	0	0	0	0	0	0	0	0	0	0	1	0	0
25.	Taruan	0	0	0	0	0	1	0	0	0	0	0	0	1	0
26.	Badapadana	0	0	0	0	0	0	0	0	0	0	0	0	1	0
27.	Saladei	0	0	0	0	0	0	0	0	0	0	0	0	1	0
28.	Alati	0	0	0	0	0	1	0	0	0	0	0	0	1	0
29.	Samana	0	0	0	0	0	0	0	0	0	0	0	0	1	0
30.	Odapada	0	0	0	0	0	0	0	0	0	0	0	1	0	0
31.	Purunabandhog	0	0	0	0	0	0	0	0	0	0	0	1	0	0
32.	Angarua	0	0	0	0	0	0	0	0	0	0	0	0	1	0
33.	Gobindapur	0	0	0	0	0	0	0	0	0	0	0	0	1	0
34.	Nandabar	0	0	0	0	0	0	0	0	0	0	0	0	1	0
35.	Krushnapur	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Water facility in DHENKNAL District

Sl. No.	Village name.	Number of							
		Tap	Well	Tank	Tube well	Hand pump	River	Other drink sources	Source of drinking water during summer
1.	Kanapalsamilmahulpal	0	0	1	0	1	0	0	HP
2.	Praharajpur	0	1	0	0	1	0	0	HP
3.	Kanapalsamilmahulpal	0	0	1	0	1	0	0	HP
4.	Purastampur	0	0	1	0	1	1	0	HP
5.	Purastampur	0	0	1	0	1	1	0	HP
6.	Sarangapur	0	0	1	0	1	0	0	HP
7.	Nilakanthapur	0	1	1	0	1	1	0	HP
8.	Majhipal	0	1	1	0	1	0	0	HP
9.	Brahmapur	0	1	0	0	1	0	0	HP
10.	Ekatali(Ka)	0	1	1	0	1	0	0	HP
11.	Ekatali(Kha)	0	1	1	0	1	0	0	HP
12.	Bentashalia	0	1	1	0	1	0	0	HP
13.	Mrudanga	0	1	1	0	1	0	0	HP
14.	Asurabandha Patana	0	1	0	0	1	1	0	HP
15.	Rodanga	0	0	1	0	1	0	10	HP
16.	Bhusala	0	1	0	0	1	1	0	HP
17.	Nimeinpur	0	1	1	0	1	0	0	HP
18.	Malapura	0	1	0	0	1	0	0	HP
19.	Kingol	0	1	0	0	1	1	0	HP
20.	Gobindabidyadharpur	0	1	0	0	1	1	0	HP
21.	Kirtanpur	0	1	0	0	1	1	0	HP
22.	Nayanilakanthapur	0	1	0	0	1	0	0	HP
23.	Jaypur	0	1	0	0	1	1	0	HP
24.	Chandar	0	1	1	0	1	0	0	HP
25.	Gadganpur	0	1	1	0	1	0	0	HP
26.	Arilo	0	1	1	0	1	0	0	HP
27.	Asurabandha	0	1	0	0	1	0	0	HP
28.	Sundhikateni	0	1	0	0	1	1	0	HP
29.	Kunda	0	1	1	0	1	0	0	HP
30.	Patapur	0	1	0	0	1	1	0	HP
31.	Surapratappur	0	1	0	0	1	1	0	HP
32.	Dadhisinga	0	1	1	0	1	0	0	HP
33.	Kumarda	0	1	0	0	1	0	0	HP
34.	Chhatakhamb	0	0	1	0	0	0	0	TK
35.	Baunsakana	0	1	1	0	1	0	0	HP
36.	Muruga	0	1	0	0	1	0	0	HP

37.	Tipilei	0	1	0	0	1	0	0	HP
38.	Samal	0	1	1	0	1	0	0	HP
39.	Balibo(L)	0	1	1	0	1	0	0	HP
40.	Garudabandi	0	1	1	0	1	0	0	HP
41.	Kesharpur	0	1	1	0	1	0	0	HP
42.	Kankhai	0	1	1	0	1	0	0	HP
43.	Anlajhari	0	1	1	0	1	0	0	HP
44.	Garhnrusinghaprasad	0	1	0	0	1	0	0	HP
45.	Gamargola	0	0	0	0	1	0	0	HP
46.	Dayanabili	0	1	0	0	1	0	0	HP
47.	Basudeipur	0	1	0	0	1	0	0	HP
48.	Anantapur	0	1	1	0	1	0	0	HP
49.	Ichhapur	0	1	1	0	0	0	0	W
50.	Gabagoda	0	1	0	0	1	0	0	HP
51.	Palasapithia	0	1	0	0	1	0	0	HP
52.	Renadapatana	0	1	0	0	1	0	0	HP
53.	Balijhati	0	1	1	0	1	0	0	HP
54.	Kainsiri	0	1	0	0	1	0	0	HP
55.	Balipada	0	1	0	0	1	0	0	HP
56.	Mathanuagan	0	1	0	0	1	1	0	HP
57.	Kuninda	0	1	0	0	1	0	0	HP
58.	Kendupada	0	1	1	0	1	0	0	HP
59.	Hariamaru	0	1	1	0	1	1	0	HP
60.	Baruan	0	1	1	0	1	0	0	HP
61.	Dhalapada	0	1	1	0	1	0	0	HP
62.	Kansaragoda	0	1	1	0	1	0	0	HP
63.	Joragadia	0	1	0	0	0	0	0	W
64.	Maluagoda	0	1	1	0	1	0	0	HP
65.	Khoksa(R)	0	1	0	0	1	0	0	HP
66.	Kumurasinga	0	1	1	0	1	0	0	HP
67.	Brahmankhantakhol	0	1	0	0	1	0	0	HP
68.	Khoksa(L)	0	1	0	0	1	0	0	HP
69.	Darjani	0	1	1	0	1	0	0	HP
70.	Senanda	0	1	1	0	1	0	0	HP
71.	Kankana	0	1	1	0	1	0	0	HP
72.	Anala	0	1	0	0	1	0	0	HP
73.	Odisha	0	1	1	0	1	1	0	HP
74.	Koriapal	0	1	1	0	1	0	0	HP
75.	Denga Bahali	0	1	0	0	1	0	0	HP
76.	Krishnapur	0	1	0	0	0	0	0	W
77.	Sitalabasa	0	1	0	0	1	0	0	HP
78.	Chandar	0	1	1	0	1	0	0	HP

In JAJPUR District:

Sl. No.	Village name.	Number of							
		Tap	Well	Tank	Tube well	Hand pump	River water	Other drink water sources	Source of drinking water during summer
1.	Karadapal	0	1	1	0	1	1	0	HP
2.	Uchabali	0	1	1	0	1	1	0	HP
3.	Badabili	0	1	1	0	1	0	0	HP
4.	Telibedha	0	1	1	0	1	1	0	HP
5.	Kumbhanagara	0	1	1	0	1	1	0	HP
6.	Gouda Bahali	0	1	1	0	1	0	0	HP
7.	Santaragadia	0	1	1	0	1	0	0	HP
8.	Tura	0	1	1	0	1	0	0	HP
9.	Tarailo	0	1	1	0	1	0	0	HP
10.	Jadikhaman	0	0	0	0	0	0	0	
11.	Nachhipura	0	1	1	0	1	0	0	HP
12.	Kharadabandi	0	1	1	0	1	0	0	HP
13.	Kabitra-	0	1	1	0	1	0	0	HP
14.	Chitri	0	1	1	0	1	0	0	HP
15.	Salijanga	0	1	1	0	1	0	0	HP
16.	Godarapal	0	1	1	0	1	0	0	HP
17.	Routpada	0	1	1	0	1	0	0	HP
18.	Andhari	0	1	1	0	1	0	0	HP
19.	Kadama	0	1	1	0	1	0	0	HP
20.	Solabandi	0	1	1	0	1	0	0	HP
21.	Asanjhar	0	1	1	0	1	0	0	HP
22.	Kiapada	0	1	1	0	1	0	0	HP
23.	Ranapur	0	1	1	0	1	0	0	HP
24.	Gopalpur	0	1	1	0	1	0	0	HP
25.	Raghupur	0	1	1	0	1	0	0	HP
26.	Ragada	0	1	0	0	1	0	0	HP
27.	Ramakrishnapur	0	1	1	0	1	0	0	HP
28.	Toranda	0	1	1	0	1	0	0	HP
29.	Belada	0	1	1	0	1	0	0	HP
30.	Mahulia	0	1	1	0	1	1	0	HP
31.	Paramanandapur	0	1	1	0	1	0	0	HP
32.	Aranto	0	1	1	0	1	0	0	HP
33.	Ragadi	0	1	1	0	1	0	0	HP
34.	Patarakana	0	1	1	0	1	0	0	HP

35.	Sampur	0	1	1	0	1	0	0	HP
36.	Sanla	0	1	1	0	1	0	0	HP
37.	Korabandi	0	1	1	0	1	0	0	HP
38.	Kacharasahi	0	1	1	0	1	0	0	HP
39.	Bachhipur	0	1	1	0	1	0	0	HP
40.	Sitalgobindapur	0	1	1	0	1	0	0	HP
41.	Pachhikote	0	1	1	0	1	0	0	HP
42.	Chingudipur	0	1	1	0	1	0	0	HP
43.	Sunachara	0	1	1	0	1	0	0	HP
44.	Jugala	0	1	1	0	1	0	0	HP
45.	Nayahatpatna	0	0	1	0	1	0	0	HP
46.	Mathurapur	0	1	1	0	1	0	0	HP
47.	Mukundapur	0	1	1	0	1	0	0	HP
48.	Kantore	0	1	1	0	1	0	0	HP
49.	Gajendrapur	0	1	1	0	1	0	0	HP
50.	Nishankhapur	0	1	1	0	1	0	0	HP
51.	Ranagundi	0	1	1	0	1	0	0	HP
52.	Tulasipur	0	1	1	0	1	0	0	HP
53.	Gourpur	0	1	1	0	1	0	0	HP
54.	Jugalakana	0	1	1	0	1	0	0	HP
55.	Mangalpur	0	1	1	0	1	0	0	HP
56.	Sulia	0	1	1	0	1	0	0	HP
57.	Sahaspur	0	1	1	0	1	0	0	HP
58.	Barakhai	0	1	1	0	1	0	0	HP
59.	Baliapal	0	1	1	0	1	0	0	HP
60.	Purbakote	0	1	1	0	1	0	0	HP
61.	Khosalpur	0	1	1	0	1	0	0	HP
62.	Narendrabhog	0	1	1	0	1	0	0	HP
63.	Manjuri	0	1	1	0	1	0	0	HP
64.	Talia	0	1	1	0	1	0	0	HP
65.	Gohiragadia	0	1	1	0	1	0	0	HP
66.	Asanagadia	0	1	1	0	1	0	0	HP
67.	Mulasar	0	1	0	0	1	0	0	HP
68.	Gayalgadia	0	1	1	0	1	0	0	HP
69.	Biridiha	0	1	0	0	1	0	0	HP
70.	Barahampur	0	1	1	0	1	0	0	HP
71.	Sanasahaspur	0	1	1	0	1	0	0	HP
72.	Solapatia	0	1	1	0	1	0	0	HP
73.	Gamharia	0	1	1	0	1	1	0	HP
74.	Khamigan	0	1	1	0	1	0	0	HP
75.	Jalanda	0	1	1	0	1	0	0	HP
76.	Oshala	0	1	1	0	1	0	0	HP
77.	Rampilo	0	1	1	0	1	0	0	HP
78.	Godigotha	0	1	1	0	1	0	0	HP

79.	Ichhapur	0	1	1	0	1	1	0	HP
80.	Nadia Bhanga	0	1	1	0	1	0	0	HP
81.	Bainsipur	0	1	1	0	1	0	0	HP
82.	Jaintira	0	1	1	0	1	0	0	HP
83.	Aranyamadana	0	1	1	0	1	0	0	HP
84.	Mandapada	0	1	0	0	0	0	0	W
85.	Pataranga	0	1	1	0	1	0	0	HP
86.	Jalapatipur	0	0	1	0	1	0	0	HP
87.	Pimpudia	0	1	0	0	1	0	0	HP
88.	Sahagan	0	1	1	0	1	0	0	HP
89.	Uttarkota	0	1	1	0	1	0	0	HP
90.	Kayan	0	1	1	0	1	0	0	HP
91.	Talagadia	0	1	1	0	1	0	0	HP
92.	Biruanpada	0	1	1	0	1	0	0	HP
93.	Mangarajpur	0	1	1	0	1	0	0	HP
94.	Uttarakhajira	0	1	0	0	1	0	0	HP
95.	Kantapal	0	1	0	0	1	0	0	HP
96.	Baragadia	0	1	1	0	1	0	0	HP
97.	Ambapal	0	1	0	0	1	0	0	HP
98.	Nigodha	0	1	1	0	1	0	0	HP
99.	Chhanchania	0	1	1	0	1	0	0	HP
100.	Sansailo	0	1	1	0	1	0	0	HP
101.	Gorakhapur	0	1	1	0	1	1	0	HP
102.	Pandiapada	0	1	1	0	1	0	0	HP
103.	Khaira	0	1	1	0	1	0	0	HP
104.	Upulei	0	1	1	0	1	0	0	HP
105.	Harichandpur	0	1	1	0	1	0	0	HP
106.	Bandalo	0	1	1	0	1	1	0	HP
107.	Jagulaigadia	0	1	0	0	1	0	0	HP
108.	Sarangapur	0	1	1	0	1	0	0	HP
109.	Nuadihi	0	1	0	0	1	0	0	HP
110.	Ollala	0	1	0	0	1	0	0	HP
111.	Jhatiasahi	0	1	1	0	1	0	0	HP
112.	Kankadajhar	0	1	0	0	1	0	0	HP
113.	Duburi	0	1	1	0	1	0	0	HP
114.	Uparagarh	0	1	1	0	1	0	0	HP
115.	Talagarh	0	1	1	0	1	0	0	HP
116.	Santasahi	0	1	1	0	1	0	0	HP
117.	Bandhagan	0	1	1	0	1	0	0	HP
118.	Kaduabandi	0	1	0	0	1	0	0	HP
119.	Saransa	0	1	1	0	1	0	0	HP
120.	Khajurinalua	0	1	1	0	1	0	0	HP
121.	Gobaragali	0	1	1	0	1	0	0	HP
122.	Gopinathpur	0	1	1	0	1	0	0	HP

123.	Tulati	0	1	1	0	1	0	0	HP
124.	Khajuribindha	0	1	0	0	1	0	0	HP
125.	Bangarkote	0	1	1	0	1	0	0	HP
126.	Pimpal	0	1	1	0	1	0	0	HP
127.	Kaliapal	0	1	0	0	1	0	0	HP
128.	Garamian	0	1	0	0	1	0	0	HP
129.	Jalanda	0	1	1	0	1	0	0	HP
130.	Galiachhanda	0	1	0	0	1	0	0	HP
131.	Mantira	0	1	0	0	1	0	0	HP
132.	Raghunathpur	0	1	1	0	1	0	0	HP
133.	Arjunjhar	0	1	0	0	1	0	0	HP
134.	Hatapur	0	1	1	0	1	0	0	HP
135.	Tarakote	0	1	1	0	1	0		HP
136.	Barundai	0	1	1	0	1	0	0	HP
137.	Gahira Patuli	0	1	0	0	1	0	0	HP
138.	Sundarapokhari	0	1	1	0	1	0	0	HP
139.	Rahemanpur	0	1	1	0	1	0	0	HP
140.	Akhanpur	0	1	1	0	1	0	0	HP
141.	Baragaji	0	1	0	0	1	0	0	HP
142.	Routapada	0	1	1	0	1	1	0	HP
143.	Kantipur	0	1	0	0	1	0	0	HP
144.	Madhapur	0	1	1	0	1	0	0	HP
145.	Kusumundia	0	1	0	0	1	0	0	HP
146.	Gantayatkateni	0	1	0	0	1	0	0	HP
147.	Gandhapal	0	1	0	0	1	0	0	HP
148.	Nandakishor Pur	0	1	1	0	1	0	0	HP
149.	Ashokjhar	0	1	1	0	1	0	0	HP
150.	Hatpur	0	1	0	0	1	0	0	HP
151.	Dhapanki	0	1	0	0	1	0	0	HP
152.	Mangobindapur	0	1	1	0	1	0	0	HP
153.	Kogan	0	1	1	0	1	0	0	HP
154.	Haladigadia	0	1	1	0	1	0	0	HP
155.	Kankadagadia	0	1	1	0	1	0	0	HP
156.	Bhalunkipatala	0	1	0	0	1	0	0	HP
157.	Mohammadhosenp	0	1	1	0	1	0	0	HP
158.	Itapur	0	1	1	0	1	0	0	HP
159.	Bhatasolapat	0	1	1	0	1	0	0	HP
160.	Bagira	0	1	1	0	1	0	0	HP
161.	Jhumpan	0	1	1	0	1	0	0	HP
162.	Salaba	0	1	1	0	1	1	0	HP
163.	Kuhika	0	1	0	0	1	0	0	HP
164.	Dhuligarh	0	1	0	0	1	0	0	HP
165.	Dudhajori	0	1	0	0	1	0	0	HP
166.	Naguan	0	1	1	0	1	0	0	HP

167.	Padi	0	1	1	0	1	0	0	HP
168.	Draupadipur	0	1	1	0	1	0	0	HP
169.	Tarapada	0	1	1	0	1	0	0	HP
170.	Nuagan	0	1	1	0	1	0	0	HP
171.	Amrutia	0	1	1	0	1	0	0	HP
172.	Taharpur	0	1	1	0	1	0	0	HP
173.	Nayagarh	0	1	1	0	1	0	0	HP
174.	Sarasada	0	1	1	0	1	0	0	HP
175.	Salakana	0	1	0	0	1	0	0	HP
176.	Ranipada	0	1	1	0	1	0	0	HP
177.	Barigodha	0	1	0	0	1	0	0	HP
178.	Hatimunda	0	0	1	0	1	0	0	HP
179.	Kandaragadia	0	1	1	0	1	0	0	HP
180.	Olia	0	1	1	0	1	0	0	HP
181.	Mulakhamba	0	1	0	0	1	0	0	HP
182.	Khurunti	0	0	0	0	1	0	0	HP
183.	Santarapur	0	1	1	0	1	0	0	HP
184.	Banahara	0	1	1	0	1	0	0	HP
185.	Sainto	0	1	1	0	1	0	0	HP
186.	Kankadapal	0	1	0	0	1	0	0	HP
187.	Gobara Ghati	0	1	1	0	1	0	0	HP
188.	Sisua	0	1	1	0	1	0	0	HP
189.	Abhayapur	0	1	1	0	1	0	0	HP
190.	Banhara	0	1	1	0	1	0	0	HP
191.	Mulasaragada	0	1	1	0	1	0	0	HP
192.	Bantala	0	1	1	0	1	0	0	HP
193.	Fazalpur	0	1	1	0	1	0	0	HP
194.	Rangaranga	0	1	1	0	1	0	0	HP
195.	Khilipankha	0	1	0	0	1	0	0	HP
196.	Nizigarh	0	1	1	0	1	0	0	HP
197.	Kuanrada	0	1	1	0	1	0	0	HP
198.	Gadapur	0	1	0	0	1	0	0	HP
199.	Chandia	0	1	1	0	1	0	0	HP
200.	Brahmanda	0	1	1	0	1	0	0	HP
201.	Bambilo	0	1	0	0	1	0	0	HP
202.	Khiro	0	1	1	0	1	0	0	HP
203.	Barada	0	1	1	0	1	0	0	HP
204.	Panasua	0	1	1	0	1	0	0	HP
205.	Chandma	0	1	1	0	1	1	0	HP
206.	Danagadi	0	1	1	0	1	0	0	HP
207.	Mangalpur	0	1	1	0	1	0	0	HP
208.	Sukarana	0	1	1	0	1	0	0	HP
210.	Aladajalasarpur	0	1	1	0	1	0	0	HP
212.	Jaintala	0	1	1	0	1	0	0	HP

213.	Barapal	0	1	0	0	1	0	0	HP
214.	Damodar pur	0	1	0	0	1	0	0	HP
215.	Palasa	0	1	1	0	1	0	0	HP
216.	Sadakpur	0	1	1	0	1	0	0	HP
217.	Charada	0	1	1	0	1	0	0	HP
218.	Dhantri	0	1	0	0	1	1	0	HP
219.	Ranasarapur	0	1	1	0	1	0	0	HP
220.	Baladia	0	1	1	0	1	0	0	HP
221.	Jamupasi	0	1	1	0	1	0	0	HP
222.	Bhakandari	0	1	1	0	1	0	0	HP
223.	Baghanata	0	1	1	0	1	0	0	HP
224.	Kanchichua	0	1	1	0	1	0	0	HP
225.	Kharajabatira	0	1	1	0	1	0	0	HP
226.	Mangal Pur	0	1	1	0	1	0	0	HP
227.	Adhagan	0	1	1	0	1	0	0	HP
228.	Bartamana	0	1	1	0	1	0	0	HP
229.	Mrutunjayapur	0	1	1	0	1	0	0	HP
230.	Depada	0	1	1	0	1	0	0	HP
231.	Nuagan	0	1	1	0	1	0	0	HP
232.	Tentulikhunta	0	1	1	0	1	0	0	HP
233.	Ranigoda	0	1	1	0	1	0	0	HP
234.	Gobindapur	0	1	1	0	1	1	0	HP
235.	Mirigi Chara	0	1	1	0	1	0	0	HP
236.	Dandkiri	0	1	1	0	1	0	0	HP
237.	Sata Bainsia	0	1	0	0	1	0	0	HP
238.	Badapatuli	0	1	1	0	1	0	0	HP
239.	Pubal	0	1	0	0	1	0	0	HP
240.	Jakha Pura	0	1	0	0	1	0	0	HP
241.	Ochinda	0	1	1	0	1	0	0	HP
242.	Dhaneswar	0	1	1	0	1	0	0	HP
243.	Santarapur	0	1	1	0	1	0	0	HP
244.	Ampolaba	0	1	1	0	1	0	0	HP
245.	Ankura Pal	0	1	1	0	1	0	0	HP
246.	Botalanda	0	1	0	0	1	0	0	HP
247.	Ranapal	0	1	1	0	1	1	0	HP
248.	Khaira dihi	0	1	0	0	1	0	0	HP
249.	Kacheri Gan	0	1	1	0	1	0	0	HP
250.	Begana	0	1	1	0	1	0	0	HP
251.	Chillipada	0	1	1	0	1	0	0	HP
252.	Sanapatuli	0	1	1	0	1	0	0	HP
253.	Gunduchi pasi	0	1	1	0	1	0	0	HP
254.	Baradhi	0	0	1	0	1	0	0	HP
255.	Mulari	0	1	1	0	1	0	0	HP
256.	Karada	0	1	1	0	1	0	0	HP

257.	Khosalapur	0	1	1	0	1	0	0	HP
258.	Barapada	0	1	1	0	1	0	0	HP
259.	Balunga Bandi	0	0	0	0	1	0	0	HP
260.	Taja Pur	0	1	1	0	1	0	0	HP
261.	Golagan	0	1	1	0	1	0	0	HP
262.	Benapur	0	1	1	0	1	0	0	HP
263.	Dhanapur	0	1	1	0	1	0	0	HP
264.	Khasa Gadia	0	1	1	0	1	0	0	HP
265.	Brajanagar	0	0	0	0	1	1	0	HP
267.	Balipasi	0	1	1	0	1	0	0	HP
268.	Sathipur	0	1	1	0	1	0	0	HP
269.	Mulapal	0	1	1	0	1	0	0	HP
270.	Kharadi	0	1	1	0	1	0	0	HP
271.	Bada barunei pada	0	1	1	0	1	0	0	HP
272.	Bharada Pasi	0	0	1	0	1	0	0	HP
273.	Janha	0	1	1	0	1	0	0	HP
274.	Talugan	0	1	1	0	1	0	0	HP
	Alia	0	1	1	0	1	0	0	HP
275.	Pathara Pada	0	1	1	0	1	0	0	HP
276.	Taluri	0	1	1	0	1	0	0	HP
277.	Dasamania	0	1	1	0	1	0	0	HP
278.	Badsulidihi	0	1	1	0	1	0	0	HP
279.	Rachhi Pur	0	1	1	0	1	0	0	HP
280.	hhotara Pur	0	1	0	0	1	0	0	HP
281.	Nuapada	0	1	1	0	1	0	0	HP
282.	Ambasara	0	1	1	0	1	0	0	HP
283.	Rudhia	0	1	1	0	1	0	0	HP
284.	Manatira	0	1	1	0	1	0	0	HP
285.	Karada pal	0	1	1	0	1	1	0	HP
286.	Oupada	0	1	1	0	1	0	0	HP
287.	Nimapali	0	1	1	0	1	0	0	HP
288.	Janha Kana	0	1	1	0	1	0	0	HP
289.	Tailada	0	1	1	0	1	0	0	HP
290.	Bajarapada	0	0	0	0	1	0	0	HP
291.	Mohammed	0	1	1	0	1	0	0	HP
292.	Bairimal	0	1	1	0	1	1	0	HP
293.	Raitikara	0	1	1	0	1	1	0	HP
294.	Alatiri	0	1	1	0	1	0	0	HP
295.	Kantigadia	0	1	1	0	1	0	0	HP
296.	Khaira Bad	0	1	0	0	1	0	0	HP
297.	Nara Pada	0	1	1	0	1	0	0	HP
298.	Kuru Pada	0	0	0	0	1	0	0	HP
299.	Rabana	0	1	1	0	1	0	0	HP
300.	Panikoili	0	1	1	0	1	0	0	HP

301.	Radhanagar	0	1	0	0	1	0	0	HP
302.	Farti Pur	0	1	1	0	1	0	0	HP
303.	Malanandapur	0	1	1	0	1	1	0	HP
304.	Marutikar	0	1	1	0	1	0	0	HP
305.	Damodara Pur	0	1	1	0	1	0	0	HP
306.	Bhiki Pur	0	0	0	0	1	0	0	HP
307.	Manohar Pur	0	1	1	0	1	0	0	HP
308.	Dania Bar	0	1	1	0	1	0	0	HP
309.	Badhei Tikar	0	0	0	0	1	0	0	HP
310.	Hetagadia	0	1	1	0	1	0	0	HP
311.	Soti	0	1	1	0	1	0	0	HP
312.	Hatibari	0	1	1	0	1	1	0	HP
313.	Namatikiri	0	0	0	0	1	0	0	HP
314.	Balipasi	0	1	1	0	1	0	0	HP
315.	Balia Posi	0	0	0	0	1	0	0	HP
316.	Brahman Bad	0	1	1	0	1	0	0	HP
317.	Khaman	0	1	1	0	1	0	0	HP
318.	Pahanga	0	1	0	0	1	0	0	HP
319.	Nahanda	0	0	1	0	1	0	0	HP
320.	Pankapal	0	1	0	0	0	0	0	W
321.	Manipur	0	1	1	0	1	0	0	HP
322.	Matabad	0	0	1	0	1	1	0	HP
323.	Kumbhirigadia	0	1	1	0	1	0	0	HP
324.	Chhatra Kana	0	1	1	0	1	0	0	HP
325.	Krushnnagar	0	1	1	0	1	0	0	HP
326.	Jagadhi	0	1	1	0	1	0	0	HP
327.	Kaitha	0	1	1	0	1	1	0	HP
328.	Krushnanagar	0	0	0	0	1	0	0	HP
329.	Laxmi Nagar	0	1	1	0	1	0	0	HP
330.	Gotutha	0	1	0	0	1	0	0	HP
331.	Sana Pingal	0	1	1	0	1	1	0	HP
332.	Bada Pingal	0	1	1	0	1	1	0	HP
333.	Tara Pur	0	0	0	0	1	0	0	HP
334.	Sala Pada	0	1	1	0	1	0	0	HP
335.	Martha Pur	0	1	0	0	1	0	0	HP
336.	Solapatta	0	1	1	0	1	0	0	HP
337.	Balarampur	0	1	1	0	1	1	0	HP
338.	Naudapur	0	0	1	0	1	0	0	HP
339.	Nilamanidei Pur	0	1	1	0	1	0	0	HP
340.	Brahmangan	0	1	1	0	1	0	0	HP
341.	Khajuri Pur	0	1	1	0	1	0	0	HP
342.	Jokadia	0	1	1	0	1	0	0	HP
343.	Khapuria Pada	0	1	1	0	1	0	0	HP
344.	Rampur Sagadi	0	1	1	0	1	0	0	HP

345.	Nuapatna	0	0	1	0	1	0	0	HP
346.	Balipasi	0	1	1	0	1	0	0	HP
347.	Jalaka	0	1	1	0	1	0	0	HP
348.	Khandara Pur	0	1	1	0	1	0	0	HP
349.	Radhanagar	0	1	0	0	1	0	0	HP
350.	Chakua	0	1	1	0	1	0	0	HP
351.	Goleipur	0	1	1	0	1	0	0	HP
352.	Mirjapur	0	1	1	0	1	0	0	HP
353.	Badabiruan	0	1	1	0	1	0	0	HP
354.	Damodar pur	0	1	0	0	1	0	0	HP
355.	Godipatana	0	1	1	0	1	1	0	HP
356.	Atta	0	1	1	0	1	0	0	HP
357.	Benga madha Pur	0	1	1	0	1	0	0	HP
358.	Rautara Pur	0	1	0	0	1	0	0	HP
359.	Telia	0	1	1	0	1	0	0	HP
360.	Jemadeipur	0	1	1	0	1	0	0	HP
361.	Haripur	0	1	1	0	1	1	0	HP
362.	Ambatola	0	1	1	0	1	0	0	HP
363.	Sana Biruan	0	1	1	0	1	0	0	HP
364.	Mangaraj Pur	0	1	0	0	1	1	0	HP
365.	Banamali Pur	0	1	1	0	1	0	0	HP
366.	Kantira	0	1	1	0	1	1	0	HP
367.	Bahabalpur	0	1	1	0	1	0	0	HP
368.	Banja	0	1	0	0	1	1	0	HP
369.	Bartanda	0	1	0	0	1	1	0	HP
370.	Solapur	0	1	0	0	1	1	0	HP
371.	Kumudi	0	0	0	0	1	1	0	HP
372.	Mangalpur	0	1	1	0	1	0	0	HP
373.	Santra	0	1	1	0	1	0	0	HP

In KEONJHAR District:

Sl. No.	Village name.	Number of							
		Tap	Well	Tank	Tube well	Hand pump	River	Other drink water sources	Source of drinking water during summer
1.	Kodapada	0	1	1	0	1	1	0	HP
2.	Beladiha	0	1	1	0	1	1	0	HP
3.	Biragobindapur	0	1	1	0	1	1	0	HP
4.	Gohirabani	0	0	0	0	1	1	0	HP
5.	Talagaon	0	1	1	0	1	1	0	HP
6.	Sadangi	0	1	1	0	1	0	0	HP
7.	Gohira	0	1	1	0	1	0	0	HP
8.	Palaspur	0	1	1	0	0	0	0	W
9.	Kumunia	0	1	1	0	1	1	0	HP
10.	Indupura	0	1	1	0	1	1	0	HP
11.	Anandapur	1	1	1	0	1	0	0	HP
12.	Kainpura	0	1	1	0	1	0	0	HP
13.	Jhadakhundi	0	1	1	0	1	0	0	HP
14.	Chamuhin	0	1	1	0	1	0	0	HP
15.	Surhusuria	0	1	1	0	1	1	0	HP
16.	Naduan	0	1	1	0	1	0	0	HP
17.	Vatisira	0	1	1	0	1	1	0	HP
18.	Tukuna	0	0	0	0	0	1	0	R
19.	Balarampur	0	1	1	0	1	0	0	HP
20.	Bancho	0	1	1	0	1	0	0	HP
21.	Naduan	0	1	1	0	1	0	0	HP
22.	Bailo	0	1	1	0	1	1	0	HP
23.	Guhalia	0	0	0	0	1	0	0	HP
24.	Nuapada	0	1	1	0	1	0	0	HP
25.	Banika	0	0	0	0	0	0	0	C
26.	Khadibil	0	1	1	0	1	0	0	HP
27.	Purunian	0	1	0	0	0	0	0	W
28.	Barigaon	0	1	1	0	1	0	0	HP
29.	Hatibandha	0	0	0	0	1	0	0	HP
30.	Panchupali	0	1	1	0	0	0	0	W
31.	Sibanarayanpu	0	1	1	0	1	1	0	HP
32.	Atasahipatana	0	1	1	0	1	0	0	HP
33.	Atasahi	0	1	1	0	1	0	0	HP
34.	Sarei	0	1	1	0	1	1	0	HP

35.	Hatisila	0	1	1	0	1	1	0	HP
36.	Kochianendi	0	1	1	0	1	0	0	HP
37.	Satatira	0	1	1	0	1	1	0	HP
38.	Raghabpur	0	1	1	0	1	0	0	HP
39.	Belabhali	0	1	0	0	0	1	0	W
40.	Deogaon	0	1	0	0	1	0	0	HP
41.	Adghuria	0	1	1	0	1	1	0	HP
42.	Bhaganai	0	1	1	0	1	0	0	HP
43.	Tolankapada	0	1	1	0	1	1	0	HP
44.	Kanpur	0	1	1	0	1	0	0	HP
45.	Dipapal	0	0	0	0	1	1	0	HP
46.	Hasanpur	0	1	1	0	1	0	0	HP
47.	Dhinkia	0	0	1	0	1	1	0	HP
48.	Hirapur	0	1	0	0	1	0	0	HP
49.	Siapada	0	0	0	0	1	1	0	HP
50.	Mangalpur	0	1	1	0	1	1	0	HP
51.	Sahanadpur	0	0	0	0	1	1	0	HP
52.	Mugupur	0	1	0	0	1	1	0	HP
53.	Haridapal	0	1	1	0	1	1	0	HP
54.	Tikara	0	0	0	0	1	1	0	HP
55.	Madanpur	0	1	1	0	1	0	0	HP
56.	Godipatna	0	1	1	0	1	0	0	HP
57.	Paikchatra	0	0	1	0	1	1	0	HP
58.	Jalasuan	0	0	0	0	1	1	0	HP
59.	Karadapal	0	1	1	0	1	0	0	HP
60.	Tarava	0	1	1	0	1	0	0	HP
61.	Naukana	0	1	1	0	1	0	0	HP
62.	Bamphidi	0	1	1	0	1	0	0	HP
63.	Rudranarayanp	0	1	1	0	1	0	0	HP
64.	Nayagarh	0	1	0	0	1	0	0	HP
65.	Machhalo	0	1	1	0	1	0	0	HP
66.	Pandua	0	1	1	0	1	0	0	HP
67.	Bato	0	1	0	0	1	1	0	HP
68.	Ambo	0	1	1	0	1	0	0	HP
69.	Pahadpur	0	1	1	0	1	0	0	HP
70.	Paramandapur	0	1	1	0	1	1	0	HP
71.	Panchara	0	1	1	0	1	0	0	HP
72.	Sainkul	1	1	1	0	1	0	0	TK
73.	Tampo	0	1	1	0	1	1	0	HP
74.	Patilo	0	1	1	0	1	0	0	HP
75.	Khadikasulaba	0	1	1	0	1	0	0	HP
76.	Kothasahi	0	1	1	0	1	0	0	HP
77.	Anjira	0	1	1	0	1	1	0	HP
78.	Fatepur	0	1	1	0	1	0	0	HP

79.	Khalana	0	1	1	0	1	0	0	HP
80.	Dantia	0	1	1	0	1	0	0	HP
81.	Agarda	0	1	0	0	1	0	0	HP
82.	Nuagaon	0	1	1	0	1	0	0	HP
83.	Madhukesari	0	1	1	0	1	1	0	HP
84.	Jenapada	0	1	1	0	1	0	0	HP
85.	Dihakatina	0	1	1	0	1	0	0	HP
86.	Dantia	0	1	1	0	1	0	0	HP
87.	Garhbandhogo	1	1	1	0	1	0	0	TK
88.	Patilo	0	1	1	0	1	0	0	HP
89.	Gobargali	0	1	1	0	1	0	0	HP
90.	Gainthagodi	0	1	1	0	0	0	0	W
91.	Atta	0	1	1	0	1	1	0	HP
92.	Kainsiari	0	1	1	0	1	0	0	HP
93.	Ullol	0	1	1	0	1	1	0	HP
94.	Lunahar	0	0	1	0	1	0	0	HP
95.	Patasura	0	1	1	0	1	0	0	HP
96.	Mangalagadia	0	1	1	0	1	0	0	HP
97.	Girigaon	0	1	1	0	1	0	0	HP
98.	Kantabania	0	1	1	0	1	0	0	HP
99.	Krushnapur	0	1	1	0	1	0	0	HP
100.	Chandali	0	0	1	0	1	0	0	HP
101.	Belada	0	1	1	0	1	0	0	HP
102.	Baharipur	0	1	1	0	1	0	0	HP
103.	Jarak	1	1	1	0	1	0	0	TK
104.	Sanapadana	0	1	1	0	1	0	0	HP
105.	Bahugadia	0	1	1	0	1	0	0	HP
106.	Haripur	0	1	1	0	1	0	0	HP
107.	Baniapasi	0	0	1	0	1	0	0	HP
108.	Bramhanda	0	1	1	0	1	0	0	HP
109.	Suanlo	0	1	1	0	1	0	0	HP
110.	Suanpada	0	1	1	0	1	0	0	HP
111.	Valuka	0	1	1	0	1	0	0	HP
112.	Napanga	0	1	1	0	1	1	0	HP
113.	Mahuri	0	0	1	0	1	0	0	HP
114.	Ujuni	0	0	1	0	1	0	0	HP
115.	Taruan	0	0	1	0	1	0	0	HP
116.	Balibaruan	0	1	0	0	1	0	0	HP
117.	Bhandaripada	0	1	1	0	1	0	0	HP
118.	Raitola	0	1	1	0	1	0	0	HP
119.	Kaithapatna	0	1	0	0	1	0	0	HP
120.	Padanpur	0	1	1	0	1	0	0	HP
121.	Badapadana	0	1	1	0	1	0	0	HP
122.	Padanpur	0	1	1	0	1	0	0	HP

123.	Saladei	0	1	1	0	1	0	0	HP
124.	Alati	0	1	1	0	1	0	0	HP
125.	Kendukhunta	0	0	1	0	1	0	0	HP
126.	Samana	0	1	1	0	1	1	0	HP
127.	Karadamali	0	1	1	0	1	0	0	HP
128.	Belasundari	0	1	1	0	1	0	0	HP
129.	Gudiadihi	0	1	1	0	1	0	0	HP
130.	Ramachandrap	0	1	1	0	1	0	0	HP
131.	Narda	0	1	1	0	1	0	0	HP
132.	Janardanpurpat	0	1	1	0	1	0	0	HP
133.	Aligaon	0	1	0	0	1	0	0	HP
134.	Tigiria	0	1	1	0	1	0	0	HP
135.	Odapada	0	1	1	0	1	1	0	HP
136.	Purunabandhog	0	0	1	0	1	0	0	HP
137.	Angarua	0	1	1	0	1	0	0	HP
138.	Jarda	0	1	1	0	1	0	0	HP
139.	Nahangi	0	1	1	0	1	0	0	HP
140.	Katenikantal	0	1	1	0	1	0	0	HP
141.	Sainpal	0	1	1	0	1	0	0	HP
142.	Bilabandha	0	1	1	0	1	0	0	HP
143.	Gobindapur	0	1	0	0	0	0	0	W
144.	Guhaldihi	0	1	1	0	1	0	0	HP
145.	Karadapal	0	1	1	0	1	0	0	HP
146.	Ganpur	0	1	1	0	1	0	0	HP
147.	Nandabar	0	1	1	0	1	0	0	HP
148.	Beguniadihi	0	1	1	0	1	0	0	HP
149.	Kolipal	0	1	1	0	1	0	0	HP
150.	Nuhamalia	0	1	1	0	1	0	0	HP
151.	Baranga	0	1	1	0	1	0	0	HP
152.	Mala	0	1	1	0	1	0	0	HP
153.	Krushnapur	0	1	1	0	1	0	0	HP
154.	Shalaparha	0	1	0	0	1	0	0	HP

Annexure No. X

RENGALI IRRIGATION PROJECT, LBC-II, PHASE-II
REPORT ON SE SURVEY FOR RRP
EXECUTIVE SUMMARY

The Socio-economic survey was conducted in 15 villages for displaced families (DFs) and in 10 sample villages for affected families (AFs) of LBC II, Phase –II of Rengali Irrigation project in Dhenkanal, Jajpur and Keonjhor district with the following objectives, in consonance with the Government of Orissa for Resettlement and Rehabilitation Policy, 2006.

- To establish social inventory of the affected villages. This will necessitate collection of all the details of the people who are likely to be affected in terms of their demographic features like names of the family members, their age, sex, educational status, occupation (primary and secondary), employment status, and their sources of income, movable and immovable assets, business enterprises and Common Property Resources (CPRs) etc.
- To estimate the households' loss of production from the land due to the land that is likely to be acquired by the project.
- To assess the extent of possession of immovable properties like houses, wells, ponds, trees etc. from every DF /AF .
- To assess the perception of the people, who are likely to be affected, towards the implementation of the project in the said area.
- To identify the Common Property Resources (CPRs) and the extent of their getting affected due to such acquisition.

The team surveyed 137 displaced families (DFs) and 209 affected families (AFs) on a sample basis as given in the Terms of Reference (TOR). While all the DFs in the project area were covered, the AFs were covered in ten selected villages (20 families per village). The details of the villages covered in both the categories of the families are mentioned below. Out of 138 DFs one family could not be surveyed because the head of the family did not cooperate. The AFs who are expected to lose more than 50% of their land were selected for the survey. In case of AFs are less than 20 in the selected village under these criteria, the AFs losing more percentage of their land were considered.

The villages and number of households surveyed are shown below.

Displaced family(DF)		
	Village Name	No. of families
1	Agarda	3
2	Bajrapalli	11
3	Biragobindapur	12
4	Dhamanagadia	21
5	Gohirigadia	5
6	Gohira	9
7	Kaibalyagadia	12
8	Madanpur	3
9	Mangarajpur	3
10	Mulaasara	1
11	Nadiabhanga	33
12	Ostapur R.F	5
13	Sainkul	6
14	Santaragadia	7
15	Talagaon	6
	Total	137

Affected family (AF)		
	Village Name	No. of families
1	Balarampur	20
2	Chitri	20
3	Kiapada	23
4	Nuapada	22
5	Salijanga	20
6	Bangarakote	20
7	G.N.Prasad	21
8	Nachhipur	20
9	Raghabapur	21
10	Asurabandha	22
Total		**209**

To begin with village meeting was organized in every village with the following objectives;

- To build rapport with the people and to explain the details of the project and its benefits to the people.
- To explain the people the benefit of the of the project
- To make them aware of the LA policy, R&R Policy and the compensation towards
  land acquisition and displacement.
- To seek their cooperation in the data collection process and in the process of project execution.
- To involve other departmental people to share the prospects of economic development of the village.
- To understand the views of the people on land acquisition, development of their village etc.

The preliminary village meeting was followed by interview of the affected families at their homes. At this level the Investigators, local facilitators including both men and women also participated in convincing the family members. The structured questionnaires were administered to retrieve information from the affected family members.

Findings of the Survey

Identification of families

The extended families were identified from each of the original family based on a family tree . As a result the family wise data were collected as per the following;

	Original Family	Extended Family[1]	Total
DF	137	104	241
AF	209	353	562

Male headed and Female headed households

The data reveals that out of the total DFs a majority of 112 (81.8%) are male headed households and the rest 25 (18.3%) are female headed households. Similarly, out of total 209 families 184 are male headed household and 25 are female headed households.

Social Category of Families

Caste Scenario in the Surveyed Villages

The caste scenario differs from village to village. There are villages where a single caste for example OBC or General Caste or SC and ST outnumber the others caste groups. Each caste groups or community has its own cultural practices, rituals etc. However, every caste respects the same of others to promote brotherhood. The lifestyle of each caste group varies from each other that primarily depend on their economic condition, occupation, exposure to outside world. Generally the general caste life style is considered better than the other caste groups. The religious minorities, however, have quite different life style due to religious ethnicity. The minority communities in the project area are rarely

[1] *Extended Family is defined by the R & R policy as "Family means the person and his or her spouse, minor sons, unmarried daughters, minor brothers or unmarried sisters, father, mother and other members residing with him or her and dependent on him or her for his or her livelihoods." Accordingly, the following categories of family members are treated as extended family for the purpose of offering the rehabilitation benefits - A major son/Grandson irrespective of his marital status, A major unmarried daughter/ Granddaughter and siste- Physically and mentally challenged person irrespective of age and sex- Minor orphan, who has lost both his/her parents and A widow or a woman divorcee*

found. Since all caste categories come under the purview of the law, the provision of benefits in case of land acquisition shall be applied according to the provisions of the law.

Categorization of the families was done as- General, Scheduled Caste (SC), Scheduled Tribe (ST) and Socially Educationally Backward Class (SEBC). Out of 137 DFs, 38(27.7%) belong to Socially Educationally Backward Class (SEBC) category while 25(18.3%) belong to Scheduled Caste (SC) and 74 (54.0%) belong to Scheduled Tribe (ST) category. Interestingly, no family falls under the general category. All families in both the categories belong to the same district and do not belong to any other area outside the district, state and the country. Similarly, under the affected family category, out of 209 families, 18 belong to general caste, 159 SEBC, 12 to SC and 20 in ST. No family has been displaced or affected by another project so far.

Distribution by Scheduled Tribe:

Survey revealed that there are four types of ST families, namely Munda, Kolha, Santala and Sahara under DF and only Sahara tribe under AF in the surveyed villages. Family and population breakup by tribe is given in the following table.

	Name of the Tribe	**No of Families**	**Total Population**	**Sex**	
				Male	**Female**
DF	Munda	11	41	26	15
	Kolha	24	144	76	68
	Santala	1	5	3	2
	Sahara	38	154	89	65
	Total	**74**	**344**	**194**	**150**
AF	Sahara	20	142	85	57

All the tribes in general are entitled to enjoy the privileges of getting reserved jobs in Government services. Education and access to awareness and other facilities enjoyed by them over the years is fast changing their life style. This also applies to the tribes surveyed in the project area.

Type of Family

The DF and AF were analyzed based on type of family i.e. Nuclear or Joint family. Nuclear families are families that consist of husband, wife and their children. The joint families are those that consist of father, mother, children, grand father and mother, brothers, their wives and children etc.

Out of 137 DFs, 116 are nuclear family and only 21 are joint family. In affected category, 138 are nuclear families while 71 are joint families.

Ration Card, Voter Card, and BPL Card

The study revealed that there are 31 Ration Card holders in DFs and 57 in AFs With regard to BPL card holders, it is found that only 44 and 64 DFs and AFs possess the same. Regarding Voter Card, 204 in AFs have it while only DFs possess the same.

Demographic conditions

Demographic details of the families by sex and age groups are shown in the following tables.

	No. of Families	Total Family Members	Male	Female
DF	137	642	303 (47.2%)	339(52.8%)
AF	209	1246	659 (52.9%)	587(47.1%)

	Age Group												
	0 - 5		6 - 15		16 - 25		26 - 45		46 - 60		Above 60		Total
	M	F	M	F	M	F	M	F	M	F	M	F	
DF	41	34	75	101	60	78	83	81	28	30	15	16	642
lower (%)	6.4	5.3	11.7	15.7	9.4	12.2	12.9	12.6	4.4	4.7	2.3	2.5	100.0
AF	43	38	113	93	107	102	224	191	90	112	83	50	1246
lower (%)	3.5	3.0	9.1	7.5	8.6	8.2	18.0	15.3	7.2	9.0	6.7	4.0	100.0

Educational Status of the DFs and AFs

Out of the 567 family members (excluding the age group 0-5) under the DFs category, maximum 205 have read up to primarily level, 196 up to secondary level, 81 up to the college level, 18 up to Post Graduate level, and 6 are found to be technically qualified. There are 61 numbers who are found to be illiterate. Similarly, under the AFs, 339 belong to primary level of education while in other categories such as secondary level the number is 430, 171 are in college level, 37 are in Post Graduation level and 19 are having technical education. There are 169 family members who are found to be illiterate.

Status of Men's Education (Excluding age group 0-5)

Category	No. of Families	Total male Members	Illiterate	Primary Education	Secondary Education	College education	Post Graduation	Technical
DF	137	262	18	98	97	35	8	6
			6.9%	37.4%	37.0%	13.4%	3.0%	2.3%
AF	209	616	71	177	221	105	26	16
			11.5%	28.7%	35.9%	17.0%	4.2%	2.6%

Status of Women's Education (Excluding age group 0-5)

The percentage of female educated is similar to the one of male educated. While no woman was found having technical education under the DFs category, only 03 were found under the AFs category. However, there are 06 technically qualified male people in DFs category and 19 in AFs category including both men and women.

Category	No. of Families	Total Women Members	Illiterate	Primary Education	Secondary Education	College education	Post Graduation	Technical
DF	137	305	43	107	99	46	10	0
			14.0%	35.0%	32.5%	15.0%	3.3%	0.0%
AF	209	549	98	162	209	66	11	3
			17.9%	29.5%	38.0%	12.0%	2.0%	0.5%

Occupation of the Families

As observed from the occupation pattern of DFs there are 44 family members who have agriculture as main occupation followed by 25 in farm labour, 43 in non-farm labour, 04 in business, 20 in salary, 1 in other source of income. In the main occupation category it is seen that there are about 20 members whose occupation is salaried job either in Government or private organizations. In the AFs category, the number of family members having main occupation is 104 in agriculture, 33 in farm labour 16 in non-farm labour, 07 in business, 45 in salaried jobs and 04 households in others.

Annual Income of the Families

As shown in the table below, there are 48 DFs whose income is less than Rs 20,000 and in AF category 30 families come under this bracket. In the highest bracket i.e. Rs 100,000/- and above of income there are only 8 families in DF and

66 in AF category of families. However, maximum families, 48 in DFs and 64 in AFs earn income in the bracket of Rs 20,001- 40,000.

Category	No. of Families	Less than 20,000	20,001-40,000	40,001-60,000	60,001-80,000	80,000-100,000	Above 100,000
DF	137	48	46	18	13	4	8
		35.0%	33.6%	13.1%	9.5%	3.0%	5.8%
AF	209	30	64	30	14	5	66
		14.4%	30.6%	14.4%	6.7%	2.4%	31.6%

Housing Pattern of the Families

With regard to the housing pattern of AFs, out of 209 households 191 have their legal record of household land while 18 do not have the same. Pertaining to the use of houses the survey reveals that maximum of 188 households use the house for own dwelling purpose while 02 use the same for shop and business purpose, 04 for combined use of own dwelling and rent, 01 as shop cum residence and 14 others use the same for the purposes which are not mentioned above. While 163 of them have electricity to their houses, 46 do not have it.

Built- up area

Out of 137 DFs a majority of 44 (32.1%) have a built up area of less than 500 sqft while 10 of them have more than 1000 sqft. Out of 209 AFs, 48 households (23.0%) have built up area of their houses less than 500 sqft followed by 22 having 501-600 sqft, 22 having 601-700 sqft, 6 having 701-800 sqft, 27 having 801-900 sqft, 07 having 901-1000 sqft and a majority of 77 households have more than 1000 sqft built up area of their houses. In both the cases the low built up area particularly below 500 sft belong to the economically backward families while the financially better off ones have 1000 or more than 1000 sqft built up areas.

Floor type

With regard to flooring of houses there are mainly three types of floors such as earthen, cement, and tile. It is observed from the table that out of 137 DFs 87 (62.8%) have earthen floor, 46(33.6%) have cement floor, 2 of them have tile structure of the flooring and 2 others have different kind of flooring. Similarly in AFs category out of 209 households 78 have earthen flooring, 122 have cemented flooring, 2 have tile and 07 others have other kinds of flooring.

Number of rooms and house materials

Out of 137 DFs, majority of 49 households have three-room houses followed by 41 with two-room houses, 10 one room houses, 19 four room houses and 18 having more than 4 rooms' houses. Maximum of 79 houses are made of mud structure followed by 49 made of brick with mud. While 79 houses have thatched roof, 33 are RCC (reinforced cement concrete) roof. In case of AFs, it is seen that maximum of 63 houses have two room houses followed by 49 four rooms, 38 three rooms and 13 one room houses. The maximum structures of the houses are brick with mud (134) followed by 71 with mud structures. As regards roof of the houses maximum of 101 households have concrete roof while 66 are thatched roof 23 tiles and 17 asbestos.

Bathroom, Toilet and washing places

The study reveals that 130 and 161 households out of 137 (DFs) and 209 (AFs) respectively do not have toilet facility in their houses or adjacent to it. A majority of people still go for open defecation that causes many diseases in disguise. Another important observation is that about 133 households in DFs category and 172 in AFs category do not have washing facility in their houses. All of them depend on outside open sources for washing purpose. This also reflects that a large majority depend on outside water bodies like ponds, wells, etc. for washing and bathing purpose which are unsafe and may cause many diseases.

Houses with cattle shed

It is observed that only 47 and 134 households in both DFs and AFs category have separate cattle sheds. It means a quite a significant number of families do not have separate shed for the animals and the animals also live at the owner's dwelling places.

Water sources for drinking

For DFs, the community tube well is the main source of drinking water in three seasons. Common wells are the second water source in all the seasons. For AFs, the community tube well is the main source of drinking water in three seasons, as well. Own wells are the second water source in all the seasons. Compared to other seasons, the dependence of households on community tube well is more for both DFs and AFs, because of the reason that all other sources the water level goes down and in some cases the source gets dried up. The distance of water sources was surveyed. Out of 137 DFs, 46 families have distance of less than 100m, followed by within house (33 families) and 100-250m (26 families). Out of

209 AFs, almost half of families, 103 families have 100-250m, followed by less than 100m (59 families).

Water sources for washing

For DFs, the community tube well which is the main source of drinking water in three seasons is also source of water for washing. Water tanks are the second water source in all the seasons. For AFs, the tendency is the same as DFs. Compared to other seasons, the dependence of households on community tube well is more for both DFs and AFs, because of the reason that all other sources the water level goes down and in some cases the source gets dried up. The distance of water sources was surveyed. Out of 137 DFs, 33families have water within house. Out of 209 AFs, almost half of families, 81 families have 100-250m.

Status of land ownership

All the lands owned by the AFs are un-irrigated land. Of the total 288.4 acres of land belonging to the surveyed affected families only 130.3 acres (45.2%) of land are found to be acquired for the project purpose. Out of 209 AFs, 11 AFs have occupied government land for which they do not have the Record of Rights or patta. However, as they said, they have been cultivating their lands for more than 30 years, and therefore, their rights to own lands will be recognized based on the rule in Odisha.

Loss caused by the Project

The survey results show loss of trees, and loss of wells as below.

Loss of Trees

Category	Number of families	Type of Trees to be lost				
		Timber	Fruit	Fuel	Fodder	Other
DFs	137	94	42	0	1	8
AF	209	405	416	5	0	14

Loss of Tube well and Wells

	Number of families	No of Tube wells	No. of Well
DF	137	7	26
AF	209	3	7

The common property resources which are in the canal corridor shall be demolished which is also a loss. The Government may consider building this when

the new colony is established by people elsewhere. Besides all these no other major loss shall take place due to land acquisition.

With regards to DFs they shall be losing their livelihood which is mainly wage earning, share cropping, jobs etc which is set in the surrounding area. The details shown in the following table are of family members who are in different livelihoods.

Crops cultivated in the area

The crops grown in the area are mainly of two types. Kharif crop is mainly rain fed crop and is cultivated during June to October, generally called as rainy season crop. It includes paddy, ground nut, cotton, jowar, maize etc. Most people in the survey area go for kharif crop which is mainly rain fed paddy crop. Failure of this crop has been due to erratic rainfall, drought etc that have been observed over the last few years. Diversification of traditional agriculture has so far not been possible due to lack of ensured irrigation and lack of extension services on modern agriculture.

Rabi crop is a winter season crop and generally cultivated from October to March, generally called as winter season crop. The type of Rabi crops are vegetables, pulses like green gram, black gram, potato wheat etc. Rabi crops are mainly cash crops that survive mainly with the available water. There are some crops like pulses that survive on soil moisture. Limited people those who have water facility go for Rabi crops. Further, diversification in Rabi crop is yet to be taken up.

Cost of Cultivation

The 209 AFs cultivate total land of 462.6 acres in a year. The survey also reveals that a total investment is Rs 14,77,500/- towards cost of cultivation per annum out of which 14.9% is on seeds, 24.4% on fertilizer, 11.9% on pesticide, 35.3% on labour, 9.5% on transport, 0.6% on equipment, 0.4% on marketing and 2.4% on other expenses. However, the net income return works out to be Rs 50,87,900/- during a year for the 209 AFs..

From the calculation it is found that per acre investment on cultivation comes to Rs 3194/- while the net income return is Rs 10,999/-. This is to be noted here that besides their own land some of the villagers also are in share cropping mode. As a result the cultivated area per annum is found to be more than what they have possessed on their own.

Labour use pattern

In DF category there are 136 of workers. There are 55 agriculture laborers, out of which 28 of them work inside the village, 27 outside of the village. In the non-agriculture category, 37 mostly work in their village, while 44 of them go out of the village. In the AF category there are 76 workers. There are 49 agriculture laborers, out of which 21 work in the village as agriculture laborer, while 29 of them go to outside for engagement. In the non-agriculture category, 7 work in their village, while19 of them go out of the village.

Possession of Livestock

All the 137 DFs and all the 209 AFs possess livestock. These livestock are income generating assets. The rearing of cow is an indication that people are in dairy occupation. Similarly, the possession of bullock is an indication that people are in the mode of traditional agriculture.

Business and Enterprises of the DFs and AFs

In the DF category, it is observed that out of 137 families only 04 of them own petty business. Those are one grocery shop, one betel shop, sale of vegetable, and sale of other seasonal products, and all those are the business to earn additional income. They have adequate access to nearby market networks to sell their products. In the AF category, out of the 209 families only 07 of them have business enterprises. Those are a grocery shop, a betel shop, a tea shop, 04 have other business activities like sale of vegetable and other seasonal products. The sale of the products is through local market network and directly to the customers.

Possession of Assets

Different assets possessed by households are shown in the table below.

No. of Families	**Households possessing assets**						
	Plough	Bullock Cart	By-cycle	Two-wheeler	TV	Phone	Others
137 (DF)	36	1	82	19	13	46	3
209 (AF)	146	18	198	86	103	259	13

Jajmani System (caste based service providers)

It is a system in traditional village society where certain caste communities offer their services to other caste communities and in return receive a share from them in their crop harvest. Out of 137 DFs 68 families still follow the system, and in case of AFs 204 families have the same. Gradually the system is fading out due to education and better employment opportunity available elsewhere. However, since the system still exists.

Among 137 DF households 43(31.4%) households receive the services of washing clothes, 28(20.4%) of hair cutting and a majority of 135 (98.5%) who receive the services of worshiping God and Goddesses and there are 4(2.9%) households who receive the other kind of services such as black smith, carpentry etc. To provide these services, the survey revealed that there are 02 (1.5%) washer men, 03 (2.2%) barber, 3 (2.2%) priests and 1 (0.7%) blacksmith across 15 villages.

Among 209 AF households 78(37.3%) households receive the services of washing clothes, 103(49.3%) of hair cutting and a majority of 208 (99.5%) who receive the services of worshiping God and Goddesses and there are 7(3.35%) households who receive the other kind of services such as black smith, carpentry etc. To provide these services, the survey revealed that there are 05 (2.4%) washer men, 05 (2.3%) barber, 03(1.4%) priests and 5 (2.3%) blacksmith, carpenters.

Information on Livelihoods of the DFs

The affected people who are going to be displaced in terms of their homestead land are found to be squatters. Most of them are below poverty line people and suffer from economic impoverishment. Their livelihoods mainly depend on daily labour in the local area and migration to other places in search of employment. Since they are poor, their children also suffer from lack of education and proper care. In spite of the facilities provided by the Government, they are yet to come up at par with the mainstream society. Their average income earning is around Rs 3000/- per month which is not sufficient to sustain the livelihood. Thanks to Government for providing BPL rice at lowest minimum price which has been a great help to them. The health front of the families also not bright since malnutrition and common diseases are common phenomenon. Women and children are the most sufferers.

Common Property Resources (CPRs)

In the displaced villages, it is observed that under the common Property resources there are grazing grounds for cattle and domestic animals, threshing ground, village forest, ground for open defecation, cremation ground, common orchards, places of worship, community hall, community ponds, community wells, pool of common cooking vessels, stage for performing public functions, light and sound system, musical instruments and Lift Irrigation (LI) points.

Some of the resources like Pond is owned by the Panchayat in some villages and used by the people in the village. However, the revenue generated by fishing activity goes to the Panchayat. Besides this there are private ponds which have been created under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) programme are owned by the villagers.

The other common properties although is the resource of the Government, are used by the villagers. They also take care of the same. Gradually the grazing land is getting squeezed due to illegal encroachment.

While some of these assets are going to be demolished in displaced villages, the same are not being disturbed in affected villages. Almost all families in both displaced and affected villages have access to such resources.

Social Interaction

Both the affected and displaced people live in close harmony with each other. At the time of need one helps the other. Due to Palli Sabha and Grama Sabha organized in the villages by the Grama Panchayats, the communities have received the benefits to participate in the decision making process of the local governance system. Each community participates in the festivals of the other to show the strength of brotherhood and concern. The families, persons are tied with personal relationship with each other. Their share their happiness and sorrows with each other.

General Observations

Economic Conditions

Agriculture being the mainstay of the rural economy and its unpredictable prospect due to lack of irrigation facility, there are also no other sustainable income opportunities for the people. Although some people have petty shops and other micro enterprises, most are migrating to distant places in search of job. People come back after months and it is observed that they get sexually transmitted diseases due to unsafe sex in alien places which has become a major health and social problem.

Of late the local Government has taken steps to promote Shelf Help Groups (SHGs) in the rural areas to help the men and women to organize themselves in groups and work together to achieve social and economic empowerment.

Health Condition of the Families and Villages

Most people suffer from the common diseases like cold, fever, diarrhea, typhoid which are waterborne diseases. People trek a long way to the block level or district dispensary facility centers. Due to poor communication facilities sometimes needy serious patients do not get proper medical treatment. Most people depend on the public transport system for visiting the health delivery facilities which are often overcrowded in rural areas and their frequency of travel is very limited. The Ambulance service at the block level is a recent development in rural areas which is an initiative of the state Government.

Water and Sanitation

Drinking water has been a major concern in the villages. There are mainly open well and tube well sources on which the people in the village depend for their drinking water. Open water sources like well, pond, stream are often contaminated and cause many waterborne diseases among the villagers. Although there is tube well in the village, the facilities are not properly maintained as a result people do not get its proper benefits. Secondly, there are one or two tube wells in a village and the families living at a distant place from the tube well site find it difficult to collect water from the source. Traditionally people are well acquainted with the open water sources in which they take bath, bathe their animals and drink the same water.

Most families lack a toilet in their homes. Traditionally open field defecation has so far been the practice. Often the people go for defecation without sandal shoes in their feet. Barefoot defecation has so far been the cause of many diseases like anemia which is caused due to hookworm mostly among women and children.

Most village streets are not properly clean that creates an unhealthy environment in the village. The pattern of household includes the dwelling place for animal which the families consider as an important asset. Human beings and domestic animals living together is generally not considered a good practice from the sanitation point of view. However, it has been practiced by the people.

Electrification in the Village

About 80% houses are electrified. Thanks to the effort of the Government under the Kutira Jyoti Yojana under which a BPL household has received the benefits of electrification at a subsidized rate.

Road Connectivity

The road connectivity in the village has improved substantially due to priority of the Government. Pradhan Mantri Gram Sadak Yojana (PMGSY) a mega scheme of Government has been promoting rural road communication system. Nowadays a village road is made of concrete.

Perception of Displaced Households regarding Irrigation Project

Awareness on the project

In case of DF, 83% of families are aware of the project mainly through the notifications displayed in villages, block, panchayat and district offices and the by hearing from the neighbors, relations etc. 68 families say that they have been informed by the Government officials while 28 have received the information from media, 34 from friends and relatives and 07 from neighboring villages. They have positive opinion about the project and feel that the project will benefit them.

In case of AFs also 170 families are well aware of the project work and feel that the project will benefit them. The sources of information for them are friend and relative (43 families), media services (63), Government officials (92) and neighboring villages (11).

Benefits to household and village

In case of DF, 92 families have expressed that the project shall be very helpful to them in terms of increasing their agricultural productivity and income while 112 said that the project shall be very beneficial for the village. However, there are some who are not fully aware of the benefits from the project and need more counseling so that they would understand the details.

In the AF category while 146 say that it would be very helpful to their family, 152 say that it will be helpful for their village also. However, 52 persons and 47 persons could nor clearly articulate in the context respectively of project benefit to the households and to the village as a whole. Since some of the families are yet to understand the details of the benefits of the project, more counseling is needed.

Loss of Assets and Livelihoods

For 60 DFs it is a loss of livelihood and assets. Another 77 persons did not respond. In AF category while 100 said that they are losing assets (mainly cultivable lands, trees, open wells, ponds on the paddy field) and livelihoods will be affected, 109 did not respond.

Expectation with regard to Compensation

In the DFs, a maximum of 65 families look for cash for land, while 29 expect land for land and 38 expect employment for land. In case of compensation being paid, 51 families prefers exact market rate of the land value while 77 others expect double the market rate for parting with their land. In the AFs, 130 families look for cash for land while 61expect land for land 12 employments for land and 06 other expectations are not clear. In case of compensation 161 families expect the rate of land value just double the existing rate while only 39 expect the existing market rate of the land value.

With regard to utilization of compensation, responses were received mainly in areas such as savings, investment and repayment of loan. As shown in the above table, in DF category, 66 families prefer to have savings either in Banks or Post Offices, 50 families intend to utilize the compensation amount for investment purpose and 47 prefer to repay their loan outstanding.

Similarly in AF category, 84 families prefer to save the compensation amount either in banks or post offices, 44 prefer to invest the amount in business and 23 families intend to utilize the compensation amount for repayment of their outstanding loan.

As regards the choice of the DF families towards a resettlement colony it is observed that 18 families ask to get settled in a resettlement colony while 5 of them have said no to the option. However, 114 families did not respond to the question.

General Feeling of the Populace in the survey Area

The DFs feel that they will get compensation for resettlement which will not be a problem for them. However, they would like Government to provide them land for construction of their houses. People are broadly aware of compensation but needs further clarification on the exact amount, mode of payment. Place for receiving payment etc.

In case of AFs, it is a setback for them also in terms of sustenance of their occupation and livelihood. They would prefer cash compensation and technical

help to start viable income generation activities or land for land which is a difficult proposition for the Government. People are under apprehension as to what would be the package of compensation, whether that would be sufficient to regain their economic condition in case of them being affected by the project.

Leaving these facts aside, people feel the greater importance of irrigation that will help them to ensure irrigation to their remaining land and provide them scope to undertake commercial agriculture by diversifying traditional agriculture and introducing the modern methods of agricultural practices. The facts mentioned above are the synopsis of the discussion that was held with DFs and AFs.

The opinion of DF and AF are listed Below:

Opinion of DFs

- They express that in case of their displacement they will face hardship in settling at new place.
- In the existing place their livelihood system is well established which will be disrupted in case of their displacement.
- It will take some time to get livelihood system established at new location.
- Government should take care of livelihood

Opinion of AFs

- Government should pay more financial benefits for acquisition of cultivable land.
- Losing part of their land will adversely affect their livelihood.
- The Government should provide other benefits to cope up with the existing livelihood status.
- Since irrigation will be provided Government should provide adequate training and extension services for diversification of agriculture.
- Younger generation educated youth should be imparted scope for establishing agro-based industry as business enterprises in the area.
- Wanted to know different crops that will be cultivated when irrigation is ensured
- Wanted training in modern agriculture practices.
- Suggested for land leveling

Opinion of Women

- They wanted to know the scope of involvement of women in agricultural activities.
- They have shown interest in crop post harvest processing and value addition and look for opportunity to get involved

Recommendations based on survey

Based on the findings the following recommendations are being made which may be considered while planning R&R plan for DFs and AFs.

Financial support

1) Till the time they are settled both in terms of habitation and economic rehabilitation, adequate monthly compensation may be provided to such families so that their families do not suffer from economic hardships/ food security.
2) A committee may be formed taking project authority, LAO and the people's representative who should interact with people and finalize the compensation package for them which may subsequently go to the RPDAC for approval. The compensation may be cash for land or land for land, should be decided by the Government. However, it may be difficult for the Government to provide land for land to all the affected households.
3) The committee shall listen to any grievance related to land acquisition and deliver the verdict after due consultation with the appropriate authorities.
4) The project AFs also suffer from economic impoverishment. Therefore, Government should help them to undertake income generating programmes under different schemes of the Government. The AFs who are losing more than 85% of their land or more should be given an opportunity to part with all their lands and the compensation may be given for 100% acquisition of their lands
5) The compensation once finalized may be given to the concerned families through Bank so that they do not face the difficulty of keeping the same in safe custody.
6) It is the responsibility of the department to see that the families utilize the paid compensation in proper way so that they improve their economic condition. Further study may be undertaken after rehabilitation to assess the socio-economic condition of the affected people.
7) The caste based service providers who are attached to a particular family under the Jajmani system shall be losing part of their livelihood due to displacement. For them adequate compensation may be planned so that they do not suffer.

8) Similarly, the landless people who used to work with some other's land as wage labour or as sharecropper should be provided with adequate compensation.

Institutional Arrangements

1. In relation to their economic rehabilitation, Government should try and negotiate with concerned departments who should help them under different schemes to cope up with their economic hardships.

2. The facilities they used to enjoy like BPL facility, ration cards, voter ID should be rescheduled at the new place. Since they are poor and are ignorant about the process, Government may engage an authority or agency to help the families in this regard.

Training Support

1. It is found that a substantial number of unemployed youths are there in the village. In view of the land acquisition, the neediest families may be provided with vocational training facilities in which the youth of the family may participate. After the training, she/he may be self employed or find a job in any organization. The concerned organizations/ departments imparting such trainings may be linked with the villages and families for doing the needful.

2. In view of the canal irrigation and considering the bright prospect of agriculture, the agriculture department may organize village level meetings to convince people on different dimension of modern agriculture and its scope for providing jobs to younger generations.

Cooperation with other Departments

1. Since it is a project of the Government toward the larger interest of the area and people, convergence of resources from various departments like Roads and Buildings, Water Resources, Agriculture department, Forest and environment, Education, Health etc may be mobilized to help the communities and the area to prosper.

Other Support

1. Many of the DFs are found to be squatters. In view of their displacement from the project site, they will be losing their houses as well as the livelihood. Therefore, they should be provided with a patch of land at a suitable place and the compensation as per the provision of the law so that they construct the house and get their family settled. However, the Government may decide as per the suitability and convenience of DFs and the Government.

2. Women being generally considered weak and vulnerable, certain activities in the R&R action plan may be targeted towards them. It is to be noted here that women are identified as affected persons on account of being either an unmarried daughter/sister above 30 years of age, widow/divorcee, or physically challenged.

3. Income generation opportunities may be created through SHG linked to irrigated agriculture, small business and small household based industries.

4. Improvements to communication facilities may be explored.

5. Attention may be given for improving education and health and sanitation facilities.

Improvement to Rengali Irrigation Project

Gross Receipt (Farm product) Expenses before and after project

Season	Crops	Area in Ha.	Seed	Manure	Fertilizer	Pest	Labour, Man, Animal	Cost per Ha. (Rs.)	Total Cost in Lakhs (Rs.)	Yield Qntl/ Ha.	Rate in Rs/Qntl Market	Total Receipt Lakhs (Rs.)
Before Project												
Rainfed												
	Paddy	13864	900	800	900	1200	4125	7925.00	1099.00	20	1400.00	3882.00
	E. Paddy	15052	900	1000	1200	1200	5250	9550.00	1437.00	20	1400.00	4215.00
	M. Paddy	5941	900	1000	1200	1200	5250	9550.00	567.00	20	1400.00	1663.00
	Pulses	3961	1500	1000	1300	900	3000	7700.00	305.00	4	5000.00	792.00
	Vegetables	792	1440	4000	7200	2800	10500	25940.00	205.00	50	2500.00	990.00
	Sub Total=	**39610**							**3613.00**			**11542.00**
After Project												
Kharif Season												
	Paddy	6990	900	1000	1200	1200	5250	9550.00	668.00	35	1400.00	3425.00
	E. Paddy	11184	900	1000	1920	1280	5250	10350.00	1158.00	35	1400.00	5480.00
	M. Paddy	9786	900	1000	1920	1280	5250	10350.00	1013.00	35	1400.00	4795.00
	Pulses	11650	1500	1000	1300	900	3000	7700.00	897.00	8	3000.00	2796.00
	Vegetables	4660	1440	4000	7200	2800	10500	25940.00	1209.00	200	2000.00	18640.00
	Sub Total=	**44270**							**4945.00**			**35136.00**
Rabi Season												
	Paddy	11557	900	1000	1600	1200	5250	9950.00	1150.00	40	1400.00	6472.00
	E. Paddy	7083	900	1000	1600	1200	5250	9950.00	705.00	40	1400.00	3966.00
	Vegetable	4660	1440	4000	7200	2800	10500	25940.00	1209.00	220	2000.00	20504.00
	Groundnut	9320	1500	1000	2520	400	4500	9920.00	925.00	20	6000.00	11184.00
	Patato	4660	1440	4000	7200	2800	10500	25940.00	1209.00	300	2000.00	27960.00
	Pulses	4660	1500	1000	1300	900	3000	7700.00	359.00	8.5	3000.00	1188.00
	Sub Total=	**41940**							**5557.00**			**71274.00**

Note:

Proposed Irrigation Potential	=	46600 Ha
Kharif (95 % of CCA)	=	44270 Ha
Rabi (90% of CCA)	=	41940 Ha
Perennial (5% of CCA)	=	2330 Ha
Total area	=	**88540 Ha**

Total Receipt	= Rs. 117952.00
Total expenditure	= Rs. 14115.00
Net Profit	= Rs. 103837.00

28/1/2014

Deputy Director, Agriculture
Jajpur

Annexure No. XI

Annexure No. XII

ESMP and ESMoP

I. ESMP

(1) ESMP Construction Stage

No	Identified Negative Impact	Location	Mitigatory Action	Responsible Organization(s) [1)]	Frequency (quantitative description is required)	Estimated Costs (quantitative description is required)
Soil Environment						
1	Soil Erosion	At high banking zone of Canal sections	• Concrete lining will be provided in inner slopes of the canal sections. • The Berms and country side slopes should be protected by turfing with good quality of grass. • Elephant friendly ramps are to be protected with boulder packing and grouting. • Plantation is proposed at the toe of country side slopes. • Lined slope drains will be provided for controlling the erosion from the embankments. • Cut and fill operation in the monsoon season will be avoided	DoWR Superintending Engineer, EE, Project Level Monitoring Unit (PMU) under Chief Engineer & Basin Manager Brahmani Left Basin.	• Inspection of the area would be done after completion of job. • Periodic inspection would be carried out before on-set of monsoon as well as after the Rabi season.	Cost of maintenance included in the P-maintenance subhead of project cost estimate.
		Borrow areas and spoil banks	• All borrow pockets should be back filled & levelled. • Spoil banks should be	DoWR Superintending Engineer, EE, Project Level	• Inspection of the area would be done after	Cost of maintenance included in the P-maintenance

			avoided as far as practicable.	Monitoring Unit (PMU) under Chief Engineer & Basin Manager Brahmani Left Basin.	completion of job. • Periodic inspection would be carried out before on-set of monsoon as well as after the Rabi season.	subhead of project cost estimate.
		Built up areas used for contractor camps and labour camps.	• Excess construction spoils should be transported to distant areas for backfilling of low lying areas. • Areas for disposal of solid wastes from camping sites should be identified.	DoWR, Through construction agency	Monitoring period as per CPCB/SPCB norms	Cost to be included in contract Package.
		Canal slopes adjacent to village areas	• Grazing by Cattle folks at maintained slopes, appearing adjacent to village areas should be discouraged through people's participation. • Ensure periodic maintenance of rain cuts after rainy season.	DoWR & village level NGOs	Periodic meeting will be held with villagers to persuade them to refrain from grazing cattle folk at the slopes of canal bank. After rainy season & before rainy season- Twice in a year.	Provided in the cost estimate

Air Pollution						
1	NOx emission at localized areas due to • Operation of Machineries and construction equipment's. • Diesel operated earth moving machineries likely to be used during construction period.	The area where excavation and embankments activities will be carried out & the road leading to the site.	• Equipment and trucks will be properly maintained at regular intervals. • Monitoring of air quality would be done at scheduled intervals.	DoWR Superintending Engineer, EE, Project Level Monitoring Unit (PMU) under Chief Engineer & Basin Manager Brahmani Left Basin.	At specific locations for a period of 24 hrs.	Air Quality management cost is to be included in contract Package.
2	Generation of dust causing increase in particulate matter.	Specific areas where excavation and construction activities will be carried out.	• Dust generation at localised sites should be minimized by water sprinklings. • Payload area of the trucks or dumpers would be covered by tarpaulin when transporting soil and other construction materials. • Construction materials should be stored in covered go-downs or enclosed spaces.	DoWR, Construction agency	At specific locations for a period of 24 hrs except rainy season.	Cost to be included in contract Package.
3	Increase in air pollution due to traffic concentration.	Village roads which will be used for carrying of materials for	• Such roads should be maintained by the contract agencies with periodic water sprinkling	DoWR & Contracting Agencies	At specific locations for a period of 24 hrs except rainy	Cost to be included in contract Package.

		construction of the canal.	by tanker mounted vehicles.		season.	
4	Road condition deterioration due to Transportation of construction material.	Haul roads	- Dumpers and trucks carrying the construction materials should be spill-proof. - Trucks and dumpers should be properly maintained. - Water will be sprinkled on the haulage roads. - Strict speed limits will be followed at the settlement areas and on the haulage roads. - All the truck and dumper drivers will be properly instructed.	DoWR & Contracting Agencies	Daily by DoWR Supervising Officers	Cost to be included in contract Package.
Noise Pollution & Vibration						
1	Increase in noise level due to construction equipments.	At locations of machineries like compressors, pumps, generators and earth moving machineries like excavator, loader, dumpers and dozers etc.	• The running of machineries should be spaced and operation time regulated to avoid synchronization of Noise. • Periodic inspection and effective maintenance of vehicles and equipment • By limiting or reducing the noise exposure time of workers. • Personnel working in noise zone may use ear plugs.	DoWR & Contracting Agencies	At specific locations by PMU (DoWR).	Cost to be included in contract Package.
2		At forest area	• Honking of vehicles should be strictly			Cost to be included in contract

			prohibited in the forest area during construction activities.			Package.
3		Near sensitive receptors	• The construction yards should be surrounded by green barriers near the sensitive receptors.(The plants absorb noise levels.) • Avoid night time activities, as because sensitivity to noise increases during the night hours in residential neighbourhood.			Cost to be included in contract Package.
4		At residential location near blasting zone	• Notify the local people in case of blasting operations or similar construction activities associated with higher noise and vibration level.			Cost to be included in contract Package.
5	Higher level of vibration	Hamlet of "Panaspal" located at 100 m Left of LBC at RD 100.49 km and a part of Revenue village "Dhamanagadia" at RD 102.15km of LBC are likely	• For minimization of overall vibration impact of tunnelling work slower RPM and higher PR will be considered. • Tunneling hours shall be limited (within the day time only).	DoWR & Contracting Agencies	By PMU (DoWR) by engaging suitable agency for recording vibration at the time of tunneling.	Cost to be included in contract Package.

		to be affected due to vibration impact of tunnel Boring Machine.				
Water Pollution						
1	• Deterioration of water quality of natural water bodies	Nearest water bodies at the construction site & labour camps	• The wastewater from construction yard and workers' camp should not be discharged into surface water bodies. • Disposal suggested through Soak pit method.	Contracting Agencies	At specific locations by PMU (DoWR).	Cost to be included in contract Package.
Hydrology						
1	Adequacy of irrigation water supply	Barrage pond as source of supply	• Irrigation planning confirms safe hydrology for pond storage. .	DoWR & Local administration	Periodical review water utilization every year	Cost chargeable to O-Misc. sub head of cost estimate.
2	Depletion of water level due to use of surface water	Nearest river or surface water bodies from which water is abstracted.	• Water required for construction will be drawn from surface water bodies only after obtaining prior permission from the appropriate government departments.	DoWR, Contracting Agencies & Local administration	Periodical review water utilization every year	Cost chargeable to O-Misc. sub head of cost estimate.
3	Ground water fluctuation.	Bore wells from which ground water may be abstracted.	• If ground water is drawn then permission from the State Ground Water Authority has to be obtained. • Use of only identified groundwater sources by the Central Ground Water Authority based on estimated quantity and	DoWR	Twice in a year	Cost chargeable to X-Ecology & Env.. sub head of cost estimate.

			expected quality for construction use. • Prepare a comprehensive plan to conserve water using best practices along with artificial recharging mechanism. • Reduce wastage of the existing water resource to avoid possible impacts on the local ground water requirement.			
4	Change in course of natural drains	Local streams and drains	• No dumping of materials into natural drains so as not to block or impede or alter drainage channels. • Adequate cross-drainage structures will be provided along the canal route.	DoWR	Pre-monsoon review	Cost chargeable to X-Ecology & Env. sub head of cost estimate.
Solid Waste Disposal						
1	Pollution of land environment due to Improper solid waste disposal practice	• Construction site • Near natural water bodies • Village areas scheduled for future development	• Relevant laws pertaining to the management and disposal of solid waste and hazardous waste will be complied with. • Debris will be separated into construction waste (concrete) and organic waste (bio-degradable). • Construction waste will be disposed off at the identified and approved locations. • No disposal will be done in the eco-sensitive areas.	• DoWR • Local Revenue Officer • Village level NGOs	Site inspection by PMU (DoWR) team on routine visits	Cost chargeable to X-Ecology & Env. sub head of cost estimate.

			• Disposal will not be done into water courses. • The disposal sites should be provided with drainage structures. • If solid wastes are to be deposited on private land then necessary permissions and agreements will be obtained. • Domestic wastes from camping sites would be disposed off on approved land in consultation with the Regional Revenue Authorities. • Trucks and dumpers carrying the debris and plying on public roads should use tarpaulin cover against spillage. • During construction of structure, the localized concreting should be avoided as far as practicable. Concrete should preferably be obtained from batching plants, suitably located. All construction spoils should be removed after the works are completed.			
Landscape						
1	Affecting landscape	Construction site	• If required, vegetation will	• DoWR		Cost

	due to Clearing and Grubbing		be removed from the construction zone before commencement of construction after obtaining necessary permissions from DFO. • All works will be carried out such that the damage or disruption to flora other than in those areas identified for cutting is kept to a bare minimum. • Ensure environmental aesthetics through canal bank plantation by using native species or pollution tolerant species with higher rate of replacement as per the State FD. • The need for wood as building materials for workers' temporary housing should be replaced with alternative eco-friendly building materials but if unavoidable, should only be bought from the authorized selling depots in the project area. • Regular and proper water sprinkling near the site to minimize dust deposition on vegetation. • No construction yard should be set up in the	officers • DFO / Officer from Forest Department • Local Revenue Officer		chargeable to X-Ecology & Env. sub head of cost estimate.

			forest areas.			
Risk & Hazard						
1	Accidents may take place in the construction sites as safety lapses	Construction site and adjoining areas.	• The general public/local residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation. • Speed restrictions shall be imposed on Project vehicles and equipment when traversing areas with sensitive receptors (residential, schools, temples, etc.). • All lifting tools and tackles will be periodically checked & certified.	Contracting Agencies		Cost to be included in contract Package.
2	Risk from unsafe stacking methods and Running of machineries & equipments	Construction site	• No material will be so stacked or placed as to cause danger or inconvenience to the labour force. • All machines to be used in the construction will be kept in good working order, and will be regularly inspected and properly maintained. • Lights, warning signs and security patrols to be	Contracting Agencies		Cost to be included in contract Package.

			deployed.			
3	Hazards due to storage spillage of oil & lubricants	Construction site & maintenance area / workshop	• Petroleum & lubricants (POL) wastes will be handled with special care. • Disposal of oil soaked wastes proposed by incineration in closed containers • The trucks and dumpers will not be washed at the nearby water bodies.	DoWR & Contractor Agencies		Cost to be included in contract Package.
Occupational Health & Safety of Workers						
1	Workers may be affected due to unhealthy living conditions.	Labour camps	• Proper sanitation facilities should be provided in the labour camps. • Sewerage disposal should be ensured by provisions of safety toilets, septic tank & soak pit disposal. • Drinking water facilities should be provided to each camp. • Free medical checkup at regular intervals should be ensured. • Anti-malaria measures should be taken up through supply of preventive medicines, mosquito nets etc.	Contracting Agencies	Site inspection & checking of records by PMU (DoWR) team	Cost to be included in contract Package.
2	Safety of working force – Staffs & labourers	Construction sites	• Personal Protective gadgets, helmets etc will be supplied to the working force. • First Aid provision will exist at all working sites.	Contracting Agencies	Site inspection & checking of records by PMU (DoWR) team	Cost to be included in contract Package.

			• Accident victims shall be taken to the nearest health centers by Ambulance. Free treatment will be imparted. • Safety instruction will be displaced at each construction sites.			
Natural Environment						
1	Loss of forest flora during construction activities.	Forest area along the canal alignment.	• Compensatory afforestation will be done in consultation with the forest department. • Canal bank plantation, Avenue plantation & Greenbelt around the colonies will be developed. • All precautions will be taken to preserve rare, endangered & endemic species of flora & fauna.	Project Authority (DoWR) & DFO (Forest Deptt.)	Once during Post-monsoon review through joint visit (PRO & SO)	Cost chargeable to X-Ecology & Env. sub head of project cost estimate.
2	Removal of natural vegetation & green cover by unscrupulous activities of labours.	Adjacent areas of labour camps	• Free fuel supply to the camped labourers will be ensured. • Plantation will be taken up around the colony.	Contractor agency	Confirm through PRO periodic site inspection	Cost to be included in contract Package.
Social Environment						
1						

1) Pls differentiate the Primarily Responsible Organization(s)(PRO) / Supporting Organization(s)(SO)

PRO- DoWR, SO- Forest Deptt, Revenue Deptt., Local NGOs

(2) ESMP Planning, Operation and Decommission Stages

No	Identified Negative Impact	Location	Mitigatory Action	Responsible Organization(s) [1)]	Timeframe/Project Cycle (Planning, Operation, Decommission)	Frequency (quantitative description is required)	Estimated Costs (quantitative description is required)
PLANNING STAGE							
A. Land Use & Land Cover							
1	Disturbance to human settlement by acquisition of land for the project	Settlements coming in the path of canal alignment.	• The canal alignment finalized after examining various alternatives so that least number of settlements would be affected. • Land compensation paid for private land as per State LA Act. • Loss of private property houses etc will be assessed by RRO. • Appropriate compensation will be paid to the PAFs as per State R&R Policy 2006.	DoWR & Revenue Deptt.	Land acquisition substantially completed.	One time	
2	Loss of Forest land & impact on Bio-diversity	Part of Birasal Forest and other scheduled Forest land in the canal alignment.	• The canal alignment was finalized with involvement of minimum forest land & after ensuring environment compatibility. • Necessary forest clearance has been obtained for construction of canal. • Compensatory afforestation & greenbelt development would be	Forest Dept. Revenue Dept. Of Odisha & MoEF, Govt. of India	• Forest clearance accorded for most Forest land. • Forest diversion proposal for only 810 ha is in progress.	One time	

			done in lieu of deforestation.		Likely to be completed by 2014		
3	Impact on pathways of mega-herbivorous i.e. Elephants	Places where elephant passages Identified	• Left Bank Canal (LBC) in its 141km traverse encounters some identified elephant passages at several locations. design structures on the wild animal crossing points as corrective alternatives. • 28 No.s of EFRs including one super passage have been already completed in the earlier subproject LBC II Phase – I. Field study reveal that these are functioning effectively. • Similar such crossing structures will be decided at strategic locations of the present area. The Dhenkanal Forest Division and Cuttack Forest Division of Odisha will identify those crossing points for taking up specific survey and engineering design of structures	Forest Dept. Revenue Dept. Of Odisha & MoEF, Govt. of India	5 Years	Prior to project operation by 2018	
4	Breeding of mosquito vectors in Borrow areas, Quarry pockets and in construction sites are potential locations for.	Construction sites & approved quarry	• All borrow areas and quarry pockets are to be backfilled. • Land leveling to be ensured after the construction period.	DoWR, & contractor agency			
5	Existing communication and transport	Roads & railway lines coming in the way of canal	• In the design stage the impact has been foreseen and care has been taken for building 356 no.s	DoWR, Design consultants, contractor		Prior to project approval /	

	facilities may be distributed due to canal construction.	alignment, namely The Express Highway & East Co Rly.	of MDR crossings, 976 no.s of VRB NH/SH, 8 no.s of VRB cum fall, totaling 1340 no.s of structures are to be constructed across canal network. • Project authorities would obtain permission from concerned NH/ Road District authorities under the State Govt. and Railway Authorities of the Govt. of India for construction of appropriate crossing structures.	agency & East coast Railway Authorities.		clearance	
6	Decommissioning of structures having historical or archeological significance	Study area	• No buildings or structure of historical importance which has been in existence for more than 75 years should be demolished without informing the relevant authorities. • Prescribed procedures for taking permissions from the local authority and / or community will be obtained if noticed during construction.	DoWR, Design consultants, contractor agency & East coast Railway Authorities.		Prior to project approval / clearance	
Water Environment							
1	• Surface water pollution. • Ground water pollution	• Canals & local water bodies • Command area wells	• Water quality of canals and all water bodies will be maintained against likely pollution	DoWR, PMU	Post project monitoring of water quality will be scrupulously carried out	Periodically for 3 years after project operation.	
2	Impact on natural drainage due to canal crossings.	Natural drains in the course of canal alignment / traverse	• Appropriate crossing structures will be provided. • In the Main Canal alignment 69 No.s of cross drainage (CD)	DoWR, Design consultants & contractor	Works to be completed by 2023-24	Prior to project approval / clearance	

			structures have been provided. • Similarly, about 674 no.s of CD structures have been proposed in the Branch Canal, Distributary, Minors and Sub minors. • Of these, one major aqueduct has been proposed at RD 124.25 km of LBC when it is to cross the Kusei River.				
Risk & Hazard							
1	Water logging	Low lying area of command area	• Post project monitoring should be carried out every year. • Conjunctive use of Ground Water. • Ensure depletion of ground water table/ release of excess recharge by pumping. • Provide adequate field drains in the water logged command area.	Directorate of Ground Water Survey and Investigation (GWS&I) under DoWR		Once in every year	
2	Weed infestation	Canal & command area	• The canal weeds are to be cleared regularly so as to create a conducive flow condition. • This can be achieved combination of mechanical & manual methods.	Project authority, DoWR		Once in every year	
Social Environment							
1	Land Acquisition and Resettlement	The project affected area / villages	• The acquisition of land and private properties shall be carried out in accordance with the LA Act 1984. • Proper compensation will be	LAO, RRO, (Revenue Deptt.)			

			provided as per State R&R Policy, 2006. • Compensation will be given to squatters.				
2	Employment opportunities for PAFs	Project affected area	• Preference will be given to engage unskilled labour from local areas & PAFs.	DoWR, & contractor agency	2023-24		
OPERATION STAGE							
Soil Environment							
1	Soil quality may be affected due to intensive agriculture.	Command area	• Integrated Nutrient Management (INM) method will be adopted to restore soil health and ensure Environmental compatibility. • Soil quality tests will be taken up before crop cultivation. • Water logging & soil salinity will be avoided by using remedial measures. • Appropriate doses of chemical fertilizers, green manures and bio–fertilizers etc. would be decided in consultation with agricultural experts (DAO of the district).	• DoWR & Dept. of Food & Agriculture, GoO. • WUAs (Pani Panchayats) of the region		As and when required	
2	Conflict in application of irrigation water on crop lands	Command area	• Command Area Management Plan will be implemented to ensure equi-distribution of water in each chakas. • Conflict resolution by WUA	• DoWR & Dept. of Food & Agriculture, GoO. • WUAs (Pani Panchayats) of the region • CADA			
Water Environment							
1	Impact on water	Command area	• Water quality of the existing	DoWR, PMU &		As and when	

	quality due to flow of residues of agro-chemicals, excess use of fertilizers and effluent from small scale industries.		water bodies will be monitored at regular intervals. • An inventory of monitored water quality should be maintained and such records shall be reviewed by the environmental management committee.	Directorate of Ground Water Survey and Investigation GWS&I under DoWR		required Once in a year	
2	Possibilities of reduction in irrigation efficiency and occurrence of health hazards due to growth of aquatic weeds in canals	Command area	• Aquatic weeds will be removed by appropriate methods, i.e. mechanical, Manual or Biological control measures. • Weed removal activities would be undertaken through Pani Panchayats (WUAs). • For removal of weeds from ponds and tanks, biological control measures are recommended. For example, Chinese grass cap (Fish Species) may be introduced which feed on the aquatic weeds of still water bodies.	DoWR & Directorate of Ground Water Survey and Investigation GWS&I under DoWR		As and when required Once in a year	
3	Impact due to water logging where ground water level is raised to 2-4 mbgl	Low lying part of command area	• Post project monitoring will be carried out at regular intervals in post-monsoon period. • Mitigation measure may be any one or all methods described here under, - Conjunctive use of Ground Water. - Reduction of canal flow - Provision of adequate field drains in the water logged command area. • Active involvement of farmers	• DoWR & Directorate of Ground Water Survey and Investigation GWS&I under DoWR • CADA (DoWR) • WUA	Every year during crop period	Once in a year during post-monsoon season	

			through Participatory Irrigation Management (PIM)				
Public Health							
1	Spread of malaria & water borne diseases due to increase in the water fringe area.	Command area	• Early diagnosis of Malaria mitigative measures will include ensuring And Prompt Treatment. • Integrated Vector Control Measures. • Training and capacity building of farmers. • Information, Education and Communication for Anti-Malaria Campaign. • Strengthening local health centers for treatment of water borne diseases. • Funding for Implementation of MMM and health Delivery plan.	DoWR & Dept. of Health, GoO.	Periodic health check up as per Health Delivery Plan.		
Climate Change							
1	Impact due to global warming. The depletion of forest cover & change in the vegetation pattern may induce global warming in a limited extent.	Command area	• By developing large scale greenery both by plantation and enhancement of crop area.	DoWR & Forest Dept., GoO.		Plantation scheme would be reviewed once in every year for 3-4 years	
DECOMMISSIONING STAGE							
1	Impact on land environment due to accumulation of debris & spoils.	The decommissioned labour camps & contractor	• The area where the temporary labours existed will be cleared from all debris, spoils and then leveled.	DoWR & contractor agency	Immediately after completion of construction works.	One time	

		camps after construction period	• The damaged construction equipment or parts would be removed.				

1) Pls differentiate the Primarily Responsible Organization(s) / Supporting Organization(s)

II. ESMoP

(1) ESMP Construction Stage

(a) Internal ESMoP

No	Identified Negative Impact	Location(s)	Monitored Parameter(s)/ Indicator(s)	Monitoring Method [1)]	Responsible Organization(s) [2)]	Frequency (quantitative description is required)	Additional Equipment Required	Estimated Costs (quantitative description is required)
Air Environment								
1	Air pollution due to emission from exhaust of vehicles & earth moving equipments; secondary emission of dust from roads	The locations are as identified in the baseline study and also includes Sensitive Receptors	PM_{10}, $PM_{2.5}$, SO_2, NO_x	HVS with Cyclone Separator followed by Gravimetric analysis for Particulate Matter (PM_{10}, $PM_{2.5}$) Jacobs and Hochheister modified (Na-arsenite) Method for NO_x and Improved West & Gaecke method for SO_2	DoWR, Project Level Monitoring Unit (PMU)	As per CPCB / SPCB norms.	Diesel generator as & when required	Apportioned to monitoring provision Rs 12.0 Million (Table No. C8-3)
Water Environment								
1	Water Quality-Contamination of surface water bodies	Surface water bodies near sensitive receptors and near settlements	The pollution parameters are mentioned in **Section No. 3.8.4.3** of EIA document**.**	Standard laboratory testing methods used.	DoWR, Project Level Monitoring Unit (PMU)	As per CPCB / SPCB norms.	Analysis will be carried out in the laboratory.	Apportioned to monitoring provision Rs 12.0 Million

		as identified in the base line study					No additional equipment will be required.	(Table No. C8-3)
2	Water Quality-Contamination of ground water	Ground water sources like dug wells, tube well as identified in the baseline study	The parameters are mentioned in **Section No. 3.8.4.4** of EIA document.	Standard laboratory testing methods used.	DoWR, Project Level Monitoring Unit (PMU)	As per CPCB / SPCB norms.	Analysis will be carried out in the laboratory. No additional equipment will be required	Apportioned to monitoring provision Rs 12.0 Million (Table No. C8-3)
Noise & Vibration								
1	Increase in level of noise & vibration beyond the limit may affect human health.	**Noise Level Measurement** Near sensitive receptors in the adjoining area of construction site 3.Near RF / PF adjacent to canal embankment **Vibration Level Measurement** At sensitive receptors & settlements in the adjoining area of tunnel site	Level of noise in dB(A) and vibration level to be recorded during construction stage.	Standard monitoring instruments for noise & vibration measurements will be used.	DoWR, Project Level Monitoring Unit (PMU)	Periodically as per CPCB / SPCB norms.		Apportioned to monitoring provision Rs 12.0 Million (Table No. C8-3)
Land Environment								
1	Degradation	1.Construction	To observe that the	Visual	DoWR, Project		None	Included in

	of land cover	areas 2.Borrow areas 3.Labour camps	concerned areas are leveled / cleared off debris after construction activities.	observation	Level Monitoring Unit			project cost estimate.
2	Soil Erosion	At high banking zone of Canal sections	• The following points will be monitored for mitigation of soil erosion. • Concrete lining in inner slopes. • Turfing of Berms and country side slopes. • Protection of elephant friendly ramps with boulder packing and grouting. • Plantation at the toe of country side slopes.	Visual observation	DoWR, Project Level Monitoring Unit		None	Included
Occupational Health & Safety of Workers								
1	Health of workers may be affected due to unhealthy working conditions.	Construction Site / labour camps	Occupational health check up as per the Health Delivery Plan.	By a qualified medical practitioner of nearby Health Centers (Health Deptt., GoO)	DoWR, Project Level Monitoring Unit with suitable assistance from DHS.			Included under O-misc. subhead of project cost estimate.

1) If measurement is required, pls refer/specify the measurement method for sampling and laboratory work.
2) Pls differentiate the Primarily Responsible Organization(s) / Supporting Organization(s)

(b) External ESMoP: Pls indicate and incorporate the requirements of external monitoring which is required by the EIA regulations of India

No	Identified Negative	Location(s)	Monitored Parameter(s)	Monitoring Method [1)]	Responsible Organization	Frequency (quantitative	Additional Equipment	Estimated Costs

	Impact		/ Indicator(s)		[2)]	description is required)	Required	(quantitative description is required)
1	Related environmental issues including elephant passages	Study area of LBC II Phase II	Frequency of elephants visits, Incidence of damage, Man-elephant conflict,	-deployment of anti-depredation squad	DoWR	To be decided by JICA & DoWR	-	-

1) If measurement is required, pls refer/specify the measurement method for sampling and laboratory work.
2) Pls differentiate the Primarily Responsible Organization(s) / Supporting Organization(s)

(2) ESMoP Planning, Operation and Decommission Stages
(a) Internal ESMoP

No	Identified Negative Impact	Location(s)	Monitored Parameter(s)/ Indicator(s)	Monitoring Method [1)]	Responsible Organization(s) [2)]	Timeframe/Project Cycle (Planning, Operation & Decommission)	Frequency (quantitative description is required)	Additional Equipment Required	Estimated Costs (quantitative description is required)
Water Environment									
1	Water Quality-Contamination of surface water bodies	Surface water bodies near sensitive receptors, settlements as identified in the base line study	As indicated in EIA report	Standard testing methods will be adopted.	DoWR, Project Level Monitoring Unit (PMU)	Operation phase	At regular interval	Analysis will be carried out in the laboratory. No additional equipment will be required	Rs. 12.0 Million identified for monitoring activities.
2	Water Quality-Contamination of ground water	Ground water sources like dug wells, tube well as	As indicated in EIA report	Standard testing methods will be adopted.	DoWR, Project Level Monitoring Unit (PMU)	Operation phase	At regular interval	Analysis will be carried out in the	Rs. 12.0 Million identified for monitoring

		identified in the baseline study						laboratory. No additional equipment will be required	activities.
3	Change in ground water level	Ground water sources like dug wells as identified in the baseline study for water level measurement	Depth to water level	Physical observation	DoWR, Project Level Monitoring Unit (PMU)	Operation phase		None	Rs. 12.0 Million identified for monitoring activities.
4	Water logging & drainage	Low lying areas of command area	Depth to water level & identification of water logged areas	Physical observation	DoWR, Project Level Monitoring Unit (PMU)	Operation phase	In the peak monsoon season & at the time of full flow in the canal	None	Rs. 12.0 Million identified for monitoring activities.
5	Weed infestation in the water body	Stagnant areas of surface water body.	Presence of weeds in the canal	Visual observation	DoWR, Project Level Monitoring Unit (PMU)	Operation phase	Post-monsoon period	None	Rs. 12.0 Million identified for monitoring activities.
6	Wastage of water	Command area	Quantity of water used for various sectors	Visual observation	DoWR, Project Level Monitoring Unit (PMU)	Operation phase	During Rabi & Khariff	None	Rs. 12.0 Million identified for monitoring activities.
Soil Environment									
1	Soil fertility may be affected	Command area	pH, Electrical conductivity, Organic matter, Primary	• EC – by EC metr (hesse, 1972) • O M – by	DoWR, Project Level Monitoring Unit (PMU) & DAO	Operation phase	At regular intervals to be decided by PMU		Rs. 12.0 Million identified for monitoring

			nutrients like N, P, K, Secondary nutrients like Na, Mg, Ca, Sodium Absorption Ratio (SAR)	Walkely & Black method • Total Nitrogen- by Mico-kjeldahl method • Available Phosphorous – by Olsen's method • Calcium & Magnesium – by Versene method • Sodium & Potassium – by Flame photometer					activities.
2	Use of agrochemicals	Command area	Dosage of fertilizers, pesticides, insecticides etc. specified by Dept. of Agriculture, Govt. of Odisha to be verified vis-a-vis the quality of soil.	Supervision & Checking at command area.	DoWR, Project Level Monitoring Unit (PMU) & DAO	Operation phase	At regular intervals to be decided by PMU	None	

(b) External ESMoP: Pls indicate and incorporate the requirements of external monitoring which is required by the EIA regulations of India

No	Identified Negative Impact	Location(s)	Monitored Parameter(s)/ Indicator(s)	Monitoring Method [1)]	Responsible Organization [2)]	Timeframe/Project Cycle (Planning, Operation & Decommission)	Frequency (quantitative description is required)	Additional Equipment Required	Estimated Costs (quantitative description is required)
1	No external monitoring is envisaged								
2									
3									

1) If measurement is required, pls refer/specify the measurement method for sampling and laboratory work.
2) Pls differentiate the Primarily Responsible Organization(s) / Supporting Organization(s)

NOTE:

A. **Primary Responsible Organization**: DoWR, PMU (DoWR)
B. **Supporting Organization**: Dept. of Agriculture, Deptt. Of Forest & Env., Deptt. Of Health & Family Planning, CADA, WUA

N.B.: The project authority ensure maintaining environmental standards (CPCB / SPCB) for various monitored parameter. Some of these standards are already been mentioned in relevant analytical statements in Chapter 3.

Annexure No. XIII

Left Bank Canal from RD 29.177Km to 141.00Km

Abstract of Cost

Sl. No	Sub-Head	Part-I 29.177 km to 71.313 km	Part-II On Going 71.313km to 100.49km	Part-III 71.313 km to 141.00 km	Part-I + Part II +Part III	Remarks
		Cost as per Present Estimate	Cost as per Present Estimate	Cost as per Present Estimate	Cost as per Present Estimate	
		Amount in Lakhs	Amount in Lakhs	Amount in Lakhs	Amount in Lakhs	
1	A - Preliminary	820.390	0.000	1499.338	2319.728	
2	B - Land	2900.000	368.380	6978.150	10246.530	
3	C - Works	10162.510	0.000	0.000	10162.510	
4	D - Regulator	2813.030	0.000	25474.523	28287.553	
5	E - Fall	0.000	0.000	567.107	567.107	
6	F - CD Work	10450.000	11593.453	32910.763	54954.217	
7	G - Bridges	3261.050	5339.635	13726.736	22327.421	
8	H - Escape	164.040	0.000	700.000	864.040	
9	K - Building	549.590	0.000	8955.000	9504.590	
10	L1 - Earth Work	19482.710	12049.086	22586.511	54118.307	
11	L2 - Linning	4875.840	0.000	5744.586	10620.426	
12	L3 - Service Road	835.000	0.000	2773.477	3608.477	
13	L4 - Tunnel	0.000	0.000	14967.500	14967.500	
14	M - Plantation	43.470	0.000	343.280	386.750	
15	O - Miscelleneous	3819.230	0.000	16300.727	20119.957	
16	P - Maintenance	884.120	0.000	1947.757	2831.877	
17	Q - Special T & P	45.220	0.000	379.350	424.570	
18	R - Communication	1915.720	0.000	597.400	2513.120	
19	U - Distributory	15932.870	0.000	61132.474	77065.344	
20	V - Water course & Field channel	1381.750	0.000	4397.926	5779.676	
21	W - Drainage	133.150	0.000	241.720	374.870	
22	X - Ecology & Environment	17042.000	0.000	500.000	17542.000	
23	Y - Losses on stock	182.460	0.000	486.939	669.399	
I	TOTAL	97694.150	29350.554	223211.265	350255.969	

Sl. No	Sub-Head	Part-I 29.177 km to 71.313 km	Part-II On Going 71.313km to 100.49km	Part-III 71.313 km to 141.00 km	Part-I + Part II +Part III	Remarks
		Cost as per Present Estimate	Cost as per Present Estimate	Cost as per Present Estimate	Cost as per Present Estimate	
		Amount in Lakhs	Amount in Lakhs	Amount in Lakhs	Amount in Lakhs	
II	Establishment 10% of Cost of I - Works less B -Land	14654.200	2898.217	21623.312	39175.729	
III	Tools & Plants (1% of cost of I Works including cost of Land	976.942	293.506	2232.113	3502.560	
IV	Suspence	0.000	0.000	0.000	0.000	
V	Receipt & Recoveries on Capital Account	-45.741	0.000	-386.920	-432.661	
	Total Direct Charges					
	Indirect Charges					
a	Capitalised value abetement of land Revenue (5% of land cost)	145.000	18.419	348.908	512.327	
b	Audit & Account charges (Generally 1% cost of I Works)	16.877	293.506	2232.113	2542.495	
	Grand Total	**113441.428**	**32854.202**	**249260.789**	**395556.419**	**Lakhs**
	Say	**1134.414**	**328.542**	**2492.608**	**3955.564**	**Crores**

Annexure No. XIV

RENGALI IRRIGATION PROJECT, PHASE-II (CCA-72967ha.)

Computation of EIRR

Unit: Million Rs.

SL.	YEAR.	Net Project Cost					Net	Net
		Construction	Canal O&M	HW	Total O&M	Total Cost	Benefit	Cash Flow
1	2013	2308.00	50.00	50.00	100.00	2408.00	0.00	-2408.00
2	2014	1500	50.00	50.00	100.00	1600.00	0.00	-1600.00
3	2015	2500	50.00	50.00	100.00	2600.00	0.00	-2600.00
4	2016	2500	50.00	50.00	100.00	2600.00	0.00	-2600.00
5	2017	3000	50.00	50.00	100.00	3100.00	0.00	-3100.00
6	2018	3000	50.00	50.00	100.00	3100.00	3744.00	644.00
7	2019	3250	50.00	50.00	100.00	3350.00	3744.00	394.00
8	2020	3250	50.00	50.00	100.00	3350.00	3744.00	394.00
9	2021	3500	50.00	50.00	100.00	3600.00	7489.00	3889.00
10	2022	2180	50.00	50.00	100.00	2280.00	7489.00	5209.00
11	2023	1224	50.00	50.00	100.00	1324.00	7489.00	6165.00
12	2024	0.00	50.00	50.00	100.00	100.00	7489.00	7389.00
13	2025	0.00	50.00	50.00	100.00	100.00	10383.00	10283.00
14	2026	0.00	50.00	50.00	100.00	100.00	10383.00	10283.00
15	2027	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
16	2028	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
17	2029	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
18	2030	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
19	2031	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
20	2032	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
21	2033	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
22	2034	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
23	2035	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
24	2036	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
25	2037	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
26	2038	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
27	2039	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
28	2040	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
29	2041	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
30	2042	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00

RENGALI IRRIGATION PROJECT, PHASE-II (CCA-72967ha.)

Computation of EIRR

Unit: Million Rs.

SL.	YEAR.	Net Project Cost					Net	Net
		Construction	Canal O&M	HW	Total O&M	Total Cost	Benefit	Cash Flow
31	2043	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
32	2044	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
33	2045	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
34	2046	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
35	2047	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
36	2048	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
37	2049	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
38	2050	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
39	2051	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
40	2052	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
41	2053	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
42	2054	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
43	2055	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
44	2056	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
45	2057	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
46	2058	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
47	2059	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
48	2060	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
49	2061	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
50	2062	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
51	2063	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
52	2064	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
53	2065	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
54	2066	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
55	2067	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
56	2068	0.00	100.00	100.00	200.00	200.00	10383.00	10183.00
							EIRR =	22.9%

Annexure No. XV

ଜିଲ୍ଲା ଗ୍ରାମ୍ୟ ଉନ୍ନୟନ ସଂସ୍ଥା, ଯାଜପୁର

ପଂଚାୟତ ସମିତି, କୋରେଇ

ଗ୍ରା.ପ. ..ଜଗନ୍ନାଥପୁର.....

ଗ୍ରାମସଭା ବିବରଣୀ

୧	୨	୩
	ଗ୍ରାମସଭାର ନାମ : ଜଗନ୍ନାଥପୁର ତାରିଖ – ୧୮.୧୦.୧୨ ଗ୍ରାମସଭାର ସ୍ଥାନ : ଆ:ଗା:କାର୍ଯ୍ୟାଳୟ ସମୟ -ପୂର୍ବାହ୍ନ ୧୦ ଘଣ୍ଟିକା.	ଉପସ୍ଥିତ ଗ୍ରାମବାସୀଙ୍କ ସାକ୍ଷର

ଅଦ୍ୟ ତା ...୧୮.୧୦.୧୨..... ରିଖ ପୂର୍ବାହ୍ନ ଘ ..୧୦..... ମିନିଟ୍ ସମୟରେ ଏହି ବିବରଣୀର ଉଭୟ ପାର୍ଶ୍ୱରେ ସାକ୍ଷରିତ ପଂଚାୟତବାସୀଂକ ଉପସ୍ଥିତିରେ ଓଡିଶା ସରକାରଂକ ନିର୍ଦ୍ଦେଶ ତଥା ମଣ୍ଡଳ ଉନ୍ନୟନ ଅଧିକାରୀ କୋରେଇଂକ ପତ୍ରସଂଖ୍ୟା ..୨୫୪୨.... ତା ..୧୪/୧୦/୧୨.... ଅନୁଯାୟୀ ଶ୍ରୀ/ ଶ୍ରୀମତୀ .....ସରପଂଚ .....ଗ୍ରାମ ପଂଚାୟତଙ୍କ ସଭାପତିତ୍ୱରେ ଗ୍ରାମସଭା ଅନୁଷ୍ଠିତ ହୋଇଥିଲା । ଏଥିରେ ନୋଡାଲ୍ ଅଧିକାରୀ ଶ୍ରୀ/ଶ୍ରୀମତୀ ....., ଗ୍ରାମ ରୋଜଗାର ସେବକ ଶ୍ରୀ/ଶ୍ରୀମତୀ ..... ଓ ଅନ୍ୟ ବିଭାଗୀୟ ଅଧିକାରୀ ଯଥା .....

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ଉପସ୍ଥିତ ଥିଲେ ।

ଗ୍ରାମସଭାର ମୋଟ ସଦସ୍ୟ ସଂଖ୍ୟା ..... ଅଟେ । ଆଜିର ସଭାରେ ଉପସ୍ଥିତ ମୋଟ ସଦସ୍ୟ ସଂଖ୍ୟା..... ଓ ଉପସ୍ଥିତ ମୋଟ ମହିଳା ସଦସ୍ୟ ସଂଖ୍ୟା ..... ଅଟେ । ଆବଶ୍ୟକ କୋରମ ହୋଇଥିବାରୁ ସଭାପତି ସଭାକାର୍ଯ୍ୟ ପରିଚାଳନା ପାଇଁ ଅନୁମତି ପ୍ରଦାନ କରିଥିଲେ । ଆଜିର ସଭାରେ

ନୋଡାଲ ଅଧିକାରୀ | ଗ୍ରାମ ରୋଜଗାର ସେବକ | ସଭାପତି

ଉପସ୍ଥିତ ଗ୍ରାମବାସୀଙ୍କ ସାକ୍ଷର	ଗ୍ରାମସଭାର ନାମ : ଗ୍ରାମସଭାର ସ୍ଥାନ ;	ତାରିଖ – ୧୮.୧୦.୧୨ ସମୟ	ଉପସ୍ଥିତ ଗ୍ରାମବାସୀଙ୍କ ସାକ୍ଷର
୧	୨		୩

ନିମ୍ନ ପ୍ରସ୍ତାବ ମାନ ଆଲୋଚିତ ହୋଇଥିଲା ।

ପ୍ରସ୍ତାବ ନଂ-୧

ପଂଚାୟତିରାଜ ବିଭାଗ ସଂପର୍କିତ ଆଲୋଚନା

ପ୍ରସ୍ତାବ ନଂ-୧(କ) ଇନ୍ଦିରା ଆବାସ ଯୋଜନା

ସଭାପତିଙ୍କ ଅନୁମତି କ୍ରମେ ସମସ୍ତ ରାଜସ୍ୱ ଗ୍ରାମର ପଲ୍ଲୀସଭା ଜରିଆରେ ଆସିଥିବା ହିତାଧିକାରୀଙ୍କ ତାଲିକା ଉପରେ ଆଲୋଚନା କରାଯାଇ ସର୍ବସମ୍ମତି କ୍ରମେ ଗୃହୀତ ହେଲା ।ଅନୁମୋଦିତ ହିତାଧିକାରୀଙ୍କ ନାମ ତାଲିକା ପରିଶିଷ୍ଟ କ ରେ ସଂଲଗ୍ନ ।

ପ୍ରସ୍ତାବ ନଂ ନଂ-୧(ଖ) ୨୦୧୩-୧୪ ରୁ ୨୦୧୭-୧୮ ପର୍ଯ୍ୟନ୍ତ ମନରେଗା କାର୍ଯ୍ୟ ଖସଡା ଓ ୨୦୧୩-୧୪ର ବାର୍ଷିକ କାର୍ଯ୍ୟ ତାଲିକା

ମନରେଗା ନିମନ୍ତେ ୨୦୧୩-୧୪ ରୁ ୨୦୧୭-୧୮ ପର୍ଯ୍ୟନ୍ତ ପାଂଚ ବର୍ଷିଆ କାର୍ଯ୍ୟ ଖସଡା ଓ ୨୦୧୩-୧୪ ର ବାର୍ଷିକ କାର୍ଯ୍ୟ ତାଲିକା ଅନୁମୋଦନ କରାଯିବା ପାଇଁ ନୋଡାଲ ଅଧିକାରୀ ପ୍ରସ୍ତାବ ଆଗତ କରିଥିଲେ । ମନରେଗା ରେ କେଉଁ କାର୍ଯ୍ୟ କରାଯାଇପାରିବ ତାହା ଉପରେ ଗ୍ରାମ ରୋଜଗାର ସେବକ ବିସ୍ତୃତ ଆଲୋଚନା କରିଥିଲେ । ଆଲୋଚନା ପରେପଲ୍ଲୀସଭାରୁ ଆସିଥିବା ପ୍ରସ୍ତାବ ଗୁଡିକୁ ସର୍ବସମ୍ମତ ଅନୁମୋଦନ ପୂର୍ବକ ଅଗ୍ରାଧିକାର କ୍ରମେ ୨୦୧୩-୧୪ ରୁ ୨୦୧୭-୧୮ ପର୍ଯ୍ୟନ୍ତ ପାଂଚ ବର୍ଷିଆ କାର୍ଯ୍ୟ ତାଲିକା ଚୁଡାନ୍ତ କରାଗଲା ଯାହା କି ପରିଶିଷ୍ଟ ଗ ରେ ସଂଲଗ୍ନ ଓ ୨୦୧୩-୧୪ ର ଚୁଡାନ୍ତ ବାର୍ଷିକ କାର୍ଯ୍ୟ ତାଲିକା ପରିଶିଷ୍ଟ ଘ ରେ ସଂଲଗ୍ନ ।

ପ୍ରସ୍ତାବ ନଂ-୧(ଗ) ଗୋପବଂଧୁ ଗ୍ରାମୀଣ ଯୋଜନାରେ ୨୦୧୩-୧୪ ବର୍ଷ ପାଇଁ କାର୍ଯ୍ୟ ତାଲିକା

ଗୋପବଂଧୁ ଗ୍ରାମୀଣ ଯୋଜନାର ନିୟମାବଳୀ ଓ ବିଭିନ୍ନ ଗ୍ରାମ ନିମନ୍ତେ ଉଦ୍ଦିଷ୍ଟ ଅର୍ଥର ପରିମାଣ ଉପରେ ଆଲୋଚନା କରାଯାଇ ପଲ୍ଲୀସଭାରୁ ଆସିଥିବା ପ୍ରକଳ୍ପ ତାଲିକା ଉପସ୍ଥାପନ ପାଇଁ ସଭାପତି ନିର୍ଦ୍ଦେଶ ଦେଇଥିଲେ । ଆଲୋଚନା ପରେ ସର୍ବସମ୍ମତ ଅନୁମୋଦନ ପୂର୍ବକ ଅଗ୍ରାଧିକାର କ୍ରମେ ୨୦୧୩-୧୪ ପ୍ରକଳ୍ପ ତାଲିକା ଚୁଡାନ୍ତ କରାଗଲା ଯାହା କି ପରିଶିଷ୍ଟ ଙ ରେ ସଂଲଗ୍ନ ।

Prasanta Biswal
Ramchandra Behera
Sri Bichitra Bank
Nayagarh Bank
Sri Bichitra Bank
Nayagarh Bank
Pradeep Kr Barik
Sri Bichitra Bank
Nayagarh Bank
Satyabrata Barik
Sri Bichitra Bank
Nayagarh Bank
Ajaba Dhej
Sri Bichitra Bank
Nayagarh Bank
Baisnabi Jena
Sri Bichitra Bank
Nayagarh Bank
Rashmi Ranjan Sahoo
Sri Bichitra Bank
Nayagarh Bank

Bijay Nayak
Sri Bichitra Bank
Nayagarh Bank
Nagendra Ramchandra Sahoo
Sri Bichitra Bank
Nayagarh Bank
Baikuntha Jena
Sri Bichitra Bank
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Nayagarh Bank
Sri Bichitra Bank
Nayagarh Bank

Ranjan Ch. Jena
ନୋଡାଲ ଅଧିକାରୀ

Subhakar Kumar Sahu
ଗ୍ରାମ ରୋଜଗାର ସେବକ

ସଭାପତି

ଉପସ୍ଥିତ ଗ୍ରାମବାସୀଙ୍କ ସାକ୍ଷର	ଗ୍ରାମସଭାର ନାମ ; ଗ୍ରାମସଭାର ସ୍ଥାନ ;	ତାରିଖ – ୧୮.୧୦.୧୨ ସମୟ	ଉପସ୍ଥିତ ଗ୍ରାମବାସୀଙ୍କ ସାକ୍ଷର
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Rashmirekha Mohapatra A.W. Purbakot

Khupaee Behera Anganwadi Worker-1 (A.W.W)

Lu Jena Anganwadi Worker II A.W.W

Jya Rock (A.W.W) Rourkela.

ଶାନ୍ତ ସାହୁ

Salata Jena. A.W.W Jaleswar

Jyotsna Kumari Das Co-operative Bank Goyerakupa

ମାତାଲ୍ଟା

Sri Subudhi Kacharasahi-1

Smti Barik Kacharasahi-2

ଶ୍ରୀ ନିତ୍ୟାନନ୍ଦ ସାହୁ

Puli Behera Anganwadi Worker Nalda Kanchira Odisha Gramya Bank (A.W.W)

ସାଲିସ୍ ଚୌହାନ୍ ଅଧିକାରୀ ଜଜ୍ (A.W.W)

ପ୍ରସ୍ତାବ ନଂ-୧(ଘ) ସିମେଂଟ୍ କଂକ୍ରିଟ୍ ରୋଡ୍ ଯୋଜନାରେ ୨୦୧୩-୧୪ ବର୍ଷ ପାଇଁ କାର୍ଯ୍ୟ ତାଲିକା

ସିମେଂଟ୍ କଂକ୍ରିଟ୍ ରୋଡ୍ ଯୋଜନାର ନିୟମାବଳୀ ଉପରେ ଆଲୋଚନା କରାଯାଇ ପଲ୍ଲୀସଭାରୁ ଆସିଥିବା ପ୍ରକଳ୍ପ ତାଲିକା ଉପସ୍ଥାପନ ପାଇଁ ସଭାପତି ନିର୍ଦ୍ଦେଶ ଦେଇଥିଲେ । ଆଲୋଚନା ପରେ ସର୍ବସମ୍ମତ ଅନୁମୋଦନ ପୂର୍ବକ ଅଗ୍ରାଧିକାର କ୍ରମେ ୨୦୧୩-୧୪ ପ୍ରକଳ୍ପ ତାଲିକା ଚୂଡାନ୍ତ କରାଗଲା ଯାହା କି ପରିଶିଷ୍ଟ ଚ ରେ ସଂଲଗ୍ନ ।

ପ୍ରସ୍ତାବ ନଂ – ୨

ଅନୁସୂଚିତ ଜନଜାତି ଓ ଅନୁସୂଚିତ ଜାତି ଉନ୍ନୟନ ବିଭାଗ ସଂପର୍କିତ ଆଲୋଚନା

ଜଂଗଲ ଅଧିକାର ଆଇନ ଉପରେ ଆଲୋଚନା କରାଗଲା । ଜଂଗଲ ଅଧିକାର ଆଇନରେ ପଟ୍ଟା ପାଇଥିବା ବ୍ୟକ୍ତିଙ୍କୁ ଇନ୍ଦିରା ଆବାସ ମିଳିବାର ବ୍ୟବସ୍ଥା ଅଛି ବୋଲି ନୋଡାଲ ଅଧିକାରୀ ପ୍ରକାଶ କରିଥିଲେ । ଜଂଗଲ ଅଧିକାର ଆଇନରେ କାହାର କିଛି ଦାବି ଥିଲେ ଉପସ୍ଥାପନ ପାଇଁ ସଭାପତି ଅନୁମତି ଦେଇଥିଲେ । ପଲ୍ଲୀସଭାରୁ କୌଣସି ଦାବି ଆସି ନାହିଁ ବୋଲି ନୋଡାଲ ଅଧିକାରୀ ପ୍ରକାଶ କରିଥିଲେ ।

ପ୍ରସ୍ତାବ ନଂ – ୩

ମହିଳା ଓ ଶିଶୁ ବିକାଶ ବିଭାଗ ସଂପର୍କିତ ଆଲୋଚନା

ସରକାରଂକ ଦ୍ୱାରା ବିଭିନ୍ନ ଯୋଜନାରେ ପ୍ରଦାନ କରାଯାଉଥିବା ସାମାଜିକ ସହାୟତା ଯଥା – IGNOAP,IGNWP,IGNDP, MBPY (OAP, WP, DP), NFBS ଯୋଜନା ବିଷୟରେ ଉପସ୍ଥିତ ଅଧିକାରୀ ଆଲୋଚନା କରିଥିଲେ । ପଲ୍ଲୀସଭା ରୁ ଆସିଥିବା ଯୋଗ୍ୟ ହିତାଧିକାରୀଂକ ତାଲିକା ଉପସ୍ଥାପନ କରାଯାଇ ସର୍ବସମ୍ମତ କ୍ରମେ ଅନୁମୋଦନ କରାଗଲା । ଏହି ତାଲିକା ପରିଶିଷ୍ଟ ଛ ରେ ସଂଲଗ୍ନ ।

ଏହି ଗ୍ରାମରେ ପେନସନ ପାଉଥିବା ହିତାଧିକାରୀଂକ ତାଲିକା ଯାଂଚ କରାଗଲା ।

୧- ପଲ୍ଲୀସଭା ପରିଶିଷ୍ଟ ଜ ରେ ସଂଲଗ୍ନ ହିତାଧିକାରୀଂକ ତାଲିକା ଅଯୋଗ୍ୟ ଅନୁଭବ କରି ତାହାର ପୁନଃ ତଦନ୍ତ କରିବା ପାଇଁ ଅନୁମୋଦନ କଲା ।

୨- ସମସ୍ତ ହିତାଧିକାରୀଂକ ତାଲିକା ଠିକ ଅଛି ବୋଲି ସର୍ବସମ୍ମତ ପ୍ରସ୍ତାବ ଅନୁମୋଦନ କରାଗଲା ।

ପୁଷ୍ଟିହୀନ ଶିଶୁଂକ ଉପରେ ଅଂଗନବାଡି କର୍ମୀଂକ ଦ୍ୱାରା ଆଲୋଚନା କରାଗଲା ।

ଗ୍ରାମ ରୋଜିଗାର ସେବକ

ସଭାପତି

ଅନ୍ନପୂର୍ଣ୍ଣା ବାରିକ
Annapurna Barik
S. Gobindpur (A.W.W)

ଦିପ୍ତି ରାଉତ

ରିନା ରାଣୀ ସତପଥୀ
Rina Rani Satapathy
CA-A.W.W
Asanagadia

ବିପିନ ଦାସ
Bipin Das

ଦିଲୀପ ତୁମୁଖ
Dilip Tumuka
Bachasi
Sarpanch

ଉପସ୍ଥିତ ଗ୍ରାମବାସୀଙ୍କ ସାକ୍ଷର	ଗ୍ରାମସଭାର ନାମ : ଗ୍ରାମସଭାର ସ୍ଥାନ :	ତାରିଖ – ୧୮.୧୦.୧୨ ସମୟ	ଉପସ୍ଥିତ ଗ୍ରାମବାସୀଙ୍କ ସାକ୍ଷର
୧	୨		୩

ପ୍ରସ୍ତାବ ନଂ - ୪

ନ।

ଗ୍ରାମ୍ୟ ଉନ୍ନୟନ ବିଭାଗ ସଂପର୍କିତ ଆଲୋଚନା

ନିର୍ମଳ ଭାରତ ଅଭିଯାନ ନିମନ୍ତେ ଆଲୋଚନା କରାଗଲା । ପଲ୍ଲୀସଭା ରୁ ଆସିଥିବା ଯୋଗ୍ୟ IHHL ହିତାଧିକାରୀଂକ ତାଲିକା ଉପସ୍ଥାପନ କରାଯାଇ ସର୍ବସମ୍ମତ କ୍ରମେ ଅନୁମୋଦନ କରାଗଲା । ଏହି ତାଲିକା ପରିଶିଷ୍ଟ ୫ ରେ ସଂଲଗ୍ନ ।

ପ୍ରସ୍ତାବ ନଂ - ୫

କୃଷି ବିଭାଗ ସଂପର୍କିତ ଆଲୋଚନା

ଉପସ୍ଥିତ କୃଷି ଅଧିକାରୀ କୃଷି ବିଭାଗର ବିଭିନ୍ନ ଯୋଜନା ଉପରେ ଆଲୋକପାତ କରିଥିଲେ । ମାଟିର ଉର୍ବରତା ପରୀକ୍ଷା, ଜଳସେଚନର ସୁବିଧା ନିମନ୍ତେ ବ୍ୟବସ୍ଥା, ଶ୍ରୀ ପ୍ରଣାଳୀରେ ଚାଷ,କୃଷି ଋଣ ବ୍ୟବସ୍ଥା ସଂପର୍କରେ ବୁଝାଇଥିଲେ । ଲୋକମାନେ ଏହି ସୁବିଧା ସବୁ ନେବା ପାଇଁ ସର୍ବସମ୍ମତ ପ୍ରସ୍ତାବ ଗୃହୀତ ହୋଇଥିଲା ।

ଅନ୍ୟାନ୍ୟ

Baswanbandhu Jena.
K.I. Kantore Clerk

Kantora Adhikari
ନୋଡାଲ ଅଧିକାରୀ

Sachin Kumar Sahu
ଗ୍ରାମ ରୋଜଗାର ସେବକ

Sarpanch
ସଭାପତି

Annexure No. XVI

Minutes of Stakeholder Meetings

MeetingRecord

Village name: Chitri
Meeting organizer: G.C. Panda
District : Jajpur
Name of Canal: L.B.C. Main Canal
Date & time 10/11/2013 (11:30AM)

Meeting place: Grama Mandap
Position: Amin Mobile No.: +919853684318
Block: Danagadi
Tehsil: Danagadi

Number of all the participants (M: F:Total:) Total - 23 Male - 23 Female - Nil
Number of affected families who attended (A): 19
Number of total affected families (B): 145
Attendance rate of affected families (A)/(B) % 13%

Contents of the meeting (if done, add ✔ in the box).

- ☑ Explanation of project outlineincluding possible impacts by the Project
- ☑ Explanation of contents and results the surveys for EIA and RRP
- ☑ Explanation of policies of compensation and R&R
- ☑ Showing a map of land to be acquired (including the land for common pasture, etc.) prepared by DoWR for land owners' information

Additional explanation (if any)

The villagers were explained regarding certainty of Main canal and recharging of Ground water.

Questions or comments by participants	Answers
Q.1) We want to know how our Agricultural lands will be irrigated although most of the lands are higher than the canal and what action has been taken up by the Govt.?	A.1) It is informed that the canal water will be utilised by lift System and most of the lands adjoining to the canal will be irrigated.

MeetingRecord

Village name: Nuapada
Meeting place: Gramya Padia
Meeting organizer: G.C Panda
Position: Amin Mobile No.: +919853684318
District : Keonjhar
Block: Ghasipura
Name of Canal: Lbe Main Canal
Tehsil: Ghasipura
Date & time 12/11/2013 (11:30AM)

Number of all theparticipants (M: F:Total:) Total - 26 Male-26 female - Nil
Number of affected families who attended (A): 22
Number of total affected families (B): 181
Attendance rate of affected families (A)/(B) % 12%

Contents of the meeting (if done, add ✔in the box).

☑ Explanation of project outlineincluding possible impacts by the Project
☑ Explanation of contents and results the surveys for EIA and RRP
☑ Explanation of policies of compensation and R&R
☑ Showing a map of land to be acquired (including the land for common pasture, etc.) prepared by DoWR for land owners' information

Additional explanation (if any)
The villagers were explained regarding benefit by the canal system and financial development due to multicropping.

Questions or comments by participants	Answers
Q. 1/ How many peoples will be benifitted due to canal system and how much compensation will be paid to the land owners ?	A/① The villagers were informed that some peoples will be directly benifitted and some will be indirectly benifitted by using canal water. Compensation according to the Govt. norm will be paid.

MeetingRecord

Village name: Kiapada
Meeting place: Village Mandap
Meeting organizer: G.C. Panda
Position: Amin Mobile No.: 9853684318
District : Jajpur
Block: Korei
Name of Canal: Korei Br. Canal
Tehsil: Vyasanagar (Jajpur Road)
Date & time 13/11/2013 (11:30 AM)

Number of all the participants (M: F:Total:) 30 Nos Male-30 female-Nil

Number of affected families who attended (A):
Number of total affected families (B):

Attendance rate of affected families (A)/(B) %

Contents of the meeting (if done, add ✔in the box).

- ☑ Explanation of project outlineincluding possible impacts by the Project
- ☑ Explanation of contents and results the surveys for EIA and RRP
- ☑ Explanation of policies of compensation and R&R
- ☑ Showing a map of land to be acquired (including the land for common pasture, etc.) prepared by DoWR for land owners'information

Additional explanation (if any)

The villagers were explained about Agriculture development and increase of Ground water level for which existing tanks and wells will be filled up.

Questions or comments by participants	Answers
Q.(1) It may be confirmed how long time the canal will be constructed and how much compensation will be paid to the land owner?	A.(1) It is clearly informed that the canal will be constructed after payment of compensation to the land owner and availability of funds. Compensation will be paid as per the Govt. Valuation rate.

Khamigaon (11:30 am to 13:30, November 22, 2013)

Number of Participants: 107 (Male: 36, Female: 71)

The Local Sarpanch[1] presided over the meeting.

1. Executive Engineer (EE) explained the purpose of the SH meeting and introduced the JICA team and officials to the participants.

2. EE explained salient information on the Project, emphasizing on Rengali LBC-II Phase-II, proposal of the state government being considered by JICA for funding, canals construction process, stages of land acquisition, constitution of *Pani Panchayat (PP)*[2], enabling PP, intensive agriculture , value addition training, water to all plots through water courses and field channels, water for three crops in a year , support for cropping pattern and market linkage, environmental considerations like planting trees on canal banks.

3. Mr Samuel Behera from Xavier Institute of Management (XIMB), conducting SIA, told about findings from survey of 136 homestead losers and 209 land losers in the project villages, and explained packages of compensation.

4. Mr Nikunja Mohanty from CEMC, conducting EIA, told about possible environmental hazards − how the survey is being done − benefits that may accrue from the canal system − water has been tested from the barrage pond and from 70th km in the canal already completed and found no harmful pollutants − water is found fit for irrigation − for use as drinking water people have to treat it before use − after project is completed water will be tested twice for 3 years − no pollutant will be allowed in the canal water.

5. EE told that the main objective was to discuss these issues and problems that may be faced by the people − invited the people to seek clarification on issues bothering them from the government officials present in the meeting.

Question − Answer session

Q. The rate of compensation is same for different types of land?

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1 Gram Panchayats are elected local self-governments of a cluster of villages in India, and the Sarpanch is in charge of it.

2 " Pani Panchayat" at the primary level consists of all the water users, as constituted within a specified hydraulic boundary of a major, medium, minor (flow and lift-both surface and ground water and creek irrigation projects funded by government as constituted under section 4 of Orissa Pani Panchayat Act 2002.

A. The Zonal Officer, in charge of land acquisition explained the process of valuation, and told that the rates will be different for different types of land. The compensation will be paid as per LAA1894 and Odisha RR Policy 2006. In future when the Act and Policy are revised compensation will be paid as per the then prevailing laws.

Q. There will be flow of water every day?

The EE explained that canal water will not flow all days in the year .There will be a period for kharif (rainy season) crops followed by a stoppage of flow after harvesting of kharif crop (during the period when water is not needed) for maintenance. Then there water will be released in the canal for the Rabi (winter) crop.

Q. We need water mostly for Rabi crops and accordingly water should be made available. Will polluted water come in the canals?

A. Water would be released for Rabi crops, and polluted water will not come in the canals.

Q. Affected people will be trained on different skills to support livelihood supporting activities?

A. Yes, training programs will be conducted by government for skill up-gradation of affected people based on the type of livelihood supporting activities they would prefer.

6. The local Sarpanch informed that people will support the construction process and thanked all participants.

Pachhikote (15:30 to 16:30, November 22, 2013):

Number of Participants: approx.100 (approx. Male: 30, Female: 70)

(The number of the people in the participants' list is 75, but in addition, there were about 25 participants, who did not sign in the list.)

The same procedure as the above meeting from 1 to 6

Question – Answer session

Q. How many villages in Pachhikote *Gram Panchayat** will be affected Where people will lose land?

A. The details are available in my office and with his staff who are touring in the affected villages. Any person who is interested can ask for the information from my staff or can get it from my office (EE asked the people to note his mobile telephone number for future communication.)

Q. I want to know if my land is going to be affected or not.

A. I can give you information when you give the particulars of the plot number, etc. (The Assistant Engineer gave his mobile phone number to the person).

MeetingRecord

Village name: Patranga
Meeting place: Shiv Mandir
Meeting organizer: M.M.Dora
Position: ~~Asst.Dy~~ Mobile No.: +919437216462
District : Jajpur
Block: Korei
Name of Canal: Patranga Minor/KBC
Tehsil: Vyasanagar
Date & time 30/1/2014 (11:00 AM)

Number of the participants (M: F:Total:) Total - 20 Male-20 Female- Nil
Number of affected families who attended (A): 20
Number of total affected families (B): 103
Attendance rate of affected families (A)/(B) % 19%

Contents of the meeting (if done, add ✔ in the box).

☑ Explanation of project outlineincluding possible impacts by the Project
☑ Explanation of contents and results the surveys for EIA and RRP
☑ Explanation of policies of compensation and R&R
☑ Showing a map of land to be acquired (including the land for common pasture, etc.) prepared by DoWR for land owners' information

Additional explanation (if any)
The villagers were explained regarding irrigation facilities and multicropping. Explained about lift irrigation facilities.

Questions or comments by participants	Answers
Q:1 It may be confirmed how many years will take to complete the canal work?	A: It is informed that the canal work will be started as soon as received of JICA loan funding and the work will be completed within 5 years.

MeetingRecord

Village name: Barabiruan
Meeting place: G.P. office of Barabiruan
Meeting organizer: M.M. Dora
Position: Asst Er. Mobile No.: +919437216462
District : Jajpur
Block: Korei
Name of Canal: Kurapada Disty/KBC
Tehsil: Vyasanagar
Date & time 30.01.2014 (12:30PM)

Number ofall theparticipants (M: F:Total:) Total 29 Nos Male-24 Nos female-5 Nos
Number of affected families who attended (A): 20
Number of total affected families (B): 107
Attendance rate of affected families (A)/(B) % 19%

Contents of the meeting (if done, add ✔in the box).

- ☑ Explanation of project outlineincluding possible impacts by the Project
- ☑ Explanation of contents and results the surveys for EIA and RRP
- ☑ Explanation of policies of compensation and R&R
- ☑ Showing a map of land to be acquired (including the land for common pasture, etc.) prepared by DoWR for land owners' information

Additional explanation (if any)
The villagers were explained regarding the Multicropping after the availibility of canal water. Explained about the recharging of Ground water.

Questions or comments by participants	Answers
Q.1) It may be confirmed whether canal will be constructed or not and if it will be constructed when ?	A.1) It is informed that canal would be constructed after the availibility of JICA loan Assistance which is in active consideration and it will be constructed.

Annexure No. XVII

PLEMC formed by GoO

Government of Orissa
Department of Water Resources

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RESOLUTION

No. LA(F)-12/97/33073/WR/BESR, The 15th Sept. 97

Sub: Re-constitutions of Project le el Environmental Management Committee for Rengali Irrigation Project to ensure effective implementation of environmental safeguard.

In supersession of this Department resolution No.34011 dated 27.9.96, the project level Environmental Management Committee is reconstituted with immediate effect for Rengali Irrigation Project with the following members.

1. Chief Engineer & Basin Manager, Brahmani Basin. .. Chairman.
2. Director, Orissa State Prevention & Control of Pollution Board. .. Member.
3. Chief Construction Engineer, Right Canal system. .. -do-
4. Director, Social Forestry, Bhubaneswar. .. -do-
5. Deputy Director, Agriculture, Dhenkanal. .. -do-
6. Chief District Medical Officer, Dhenkanal. .. -do-
7. Chief District Medical Officer, Angul. .. -do-
8. Conservator of Forests, Angul. .. -do-
9. D.F.O., Wildlife Divn. Angul. .. -do-
10. Superintending Engineer, Ground Water Survey & Investigation. .. -do-
11. Joint Director (Engineering) CADA. .. -do-
12. D.F.O., Deogarh. .. -do-
13. Dy. Director, Fisheries, Dhenkanal. .. -do-
14. Divisional Manager, OFDC, Angul. .. -do-
15. Dy. Director, Mines, Talcher. .. -do-
16. Executive Engineer, PHD, Talcher. .. -do-
17. Spl. L.A. & R.R.O., Rengali Irrigation Project, Baghuabol. .. -do-
18. Director, Institute for Socio-Economic Development, Angul. .. -do-

P.T.O.

19. Director, Peoples Institute for participatory Action & Research, Mahimagadi, Dhenkanal. .. Member.

20. Superintending Engineer, Head Works Circle, Sunal. .. Member Secretary.

The Committee will meet at least once in every three months to review the progress of the implementation of the environmental safeguard and submit progress reports to the W.R. Department and six monthly progress report to the Ministry of Water Resources as well as to the Ministry of Environment and Forest, Govt. of India.

ORDER: Ordered that the Resolution will be published in the Extra Ordinary Gazettee of Orissa.

By Orders of Governor.

G.C. Patel,
Deputy Secretary to Govt.

Memo No. 33073 //Dated 15-9-97

Copy forwarded to the Chairman/All Members/Member Secretary for information and necessary action.

Deputy Secretary to Govt.

Memo No. 33074 // Dated 15-9-97

Copy forwarded to the Addl. Director, Govt. of India, Ministry of Environment and Forest, Paryavaran Bhawan, C.G.O. Complex, Lodi Road New Delhi - 110003 for information.

Deputy Secretary to Govt.

Memo No. 33075 //Dated 15-9-97

Copy forwarded to the Director, Printing, Stationary & Publication, Orissa for publication in E.O.G., Orissa.

He is requested to furnish 15 extra copies to this Deptt.

Deputy Secretary to Govt.

Memo No. 33076 //Dated 15.9.97

Copy forwarded to Engineer-in-Chief, Water Resources/C.E., Project Planning and Formulation for information and necessary action.

Deputy Secretary to Govt.

Memo No. 33077 // Dated 15.9.97

Copy forwarded to the A.C.F. (R&R), Directorate, Deptt. of Water Resources/Major-I -II & III Branch/Guard file (5 copies) for information, and necessary action.

Deputy Secretary to Govt.

Memo No. 33078 //Dated 15-9-97

Copy to the C.E. & Basin Manager, Rengali Basin for favour of information and necessary action. The officials from the Regional Officer, MOEF, Govt. of India, Bhubaneswar who would be monitoring the implementation of environmental safeguard should be given full cooperation and all facilites be extended to them in supply of documents/data by the Project authorities during their inspection.

No-22494 dt - 19.9.97

SM1997 VII-52/97

Deputy Secretary to Govt.

Copy forwarded to SE Head Quarters for information.

Annexure No. XVIII

MONITORING FORMAT

-If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews, JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent When necessary, the project proponent should refer to the following monitoring form for submitting reports.

-When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	**Monitoring Result of Reporting Period**
ex.) Responses/Actions to Comments and Guidance from Government Authorities To be filled with Conditions of Forest Clearance Stage I, Stage II and Environmental Clearance **Stage-I conditions Dt.21.11.1996** 1. Immediate action should be taken for transfer and mutation of equivalent non-forest land in favor of the state forest Department. 2. The user Agency will transfer the cost of Compensatory Afforestation revised as on date to incorporate existing wage structure in favour of the forest Department. 3. Funds for compensatory afforestation will be provided for	*To be filled after project start*

afforestation /rehabilitation of an area equivalent to forest area proposed to be the land offered for compensatory afforestation .this area will be utilized for the purposed irrigated plantation for which free water will such a programme at present. Certain areas will be identified for eco-tourism and will be developed as such. 4. The Advisory committee recommended the proposal for approval for diversion of (2159.43-52.03 ha) forest land. 5. The project will provide crossing points for wild elephants where necessary after consultation with officers at local level. **Stage-II conditions Dt.13/14.05.2003** 1. Legal status of the forest shall remain unchanged 2. Compensatory Afforestation shall be raised over equivalent non forest land and shall be maintained in the project cost. 3. Demarcation of the area will be done on ground at project cost using 4 feet high RCC Pillars with Serial No. , forwarded back bearing and distance from pillar to pillar 4. The non forest land transferred to the forest department for compensatory Afforestation shall be declared as: Reserve Forest" under Indian Forest Act, 1927.	

5. Trees shall be felled only when it become necessary and under direct supervision of State Forest Department. 6. Reservoir so created shall be declared as "Reserve Forest" under Indian Forest Act, 1927 with regulated fishing guide. 7. Irrigated plantation shall be raised and maintained at the Project cost. 8. Areas identified for Eco- tourism will be developed at the Project Cost. 9. Crossing points for wild elephants will be provided in consultation with the State Forest Department at the Project Cost. 10. Canal bank plantation shall be raised in consultation with the State Forest Department at the Project Cost 11. No tree felling in the area between FRL and 4 mtr bellow FRL shall be carried out. 12. Water will be provided free of cost to the Forest Department for raising nursery/ plantation in nearby areas. 13. Catchment area treatment plan shall be implemented under the supervision of State Forest Department 14. Re-settlement and Rehabilitation plan for the displaced people shall be implemented immediately by the State Government 15. No labour camp shall be established on the forest land	

16. Sufficient fire wood depot should be opened after procuring fire wood from Orissa Forest Development Corporation (OFDC) 17. The User Agency shall ensure that there should be no damage to the available wildlife 18. The approval under the Forest (Conservation) Act,1980 is subject to the clearance under the Environment (Protection) Act,1986 if required 19. The forest land shall not be used for any purpose other than that specific in the proposal 20. The action initiated against erring officials and the prosecution of those officials must be completed by October,2003. All other Officers and Agencies those who are yet to be identified, shall be identified as erring Officials and Agencies by RCCF, Bhubaneswar who shall advise State Government to initiate action against them by 31ST October 2003 and complete the task by 31.03.2004 RCCF, Bhubaneswar will quarterly review compliance/ progress of this condition. 21. Any other conditions that the State Government as well as CCF (Central Regional Office, Bhubaneswar) may impose from time to time for the protection and improvement of flora and fauna in forest area.	

2. Result of Monitoring

2.1 Construction Phase

2.1.1 Pollution

Air Environment

Item	**Unit**	**Measured Value (Mean)**	**Measured Value (Max)**	**Indian Standard (NAAQS 2009)**	**Referred International Standard**	**Remarks (Measurement Point, Frequency, Method, etc.)**		
						Measurement Point	**Frequency**	**Method**
PM10	**µg/ m^3**	*To be filled after project start*	*To be filled after project start*	100	To be filled	Damdarpur Panaspal Laxminagar Badapatuli Korda Belabahali Ghasipura Gohira Ragadi	As per CPCB / SPCB norms.	Gravimetry
PM2.5		ditto	ditto	60	ditto		ditto	Gravimetry
SO2		ditto	ditto	80	ditto		ditto	Jacobs and Hochheister modified (Na-arsenite) Method
NOx		ditto	ditto	80	ditto		ditto	Improved West & Gaecke method

Water Environment

Item	Unit	Measured Value(Mean)	Measured Value(Max)	Indian Standard (IS:10500 Drinking Water)	Referred International Standard	Remarks		
						Measurement Point	Frequency	Method
Surface Water								
Color	Hazen	*To be filled after project start*	*To be filled after project start*	5	To be filled	Panaspal Chadipal Gohira Belabahali Korda Laxminagar	As per CPCB / SPCB norms.	APHA 2120 (B)
Odour		ditto	ditto	UO	ditto			APHA 2150 (B)
Taste		ditto	ditto	Agbl	ditto			2160 Taste-B,C
Conductivity	µmho/cm	ditto	ditto		ditto			APHA 2510 (B)
Turbidly	NTU	ditto	ditto	5	ditto			APHA 2130 B
pH		ditto	ditto	6.5-8.5	ditto			APHA 4500 (B)
COD	Mg/L	ditto	ditto		ditto			APHA 5220(B)
BOD	Mg/L	ditto	ditto		ditto			APHA 5210(B)
Total Hardness	Mg/L	ditto	ditto	300	ditto			APHA 2340 (C)

Iron	Mg/L	ditto	ditto	0.3	ditto			APHA 3500 (B)
Chloride	Mg/L	ditto	ditto	250	ditto			APHA 4500 Cl (B)
Residual Chlorine	Mg/L	ditto	ditto	0.2	ditto			APHA 4500 Cl-B,C
Total SS	Mg/L	ditto	ditto		ditto			APHA 2540 (D)
Total DS	Mg/L	ditto	ditto		ditto			APHA 2540 (C)
DO	Mg/L	ditto	ditto		ditto			APHA 4500(B)
Calcium	Mg/L	ditto	ditto	75	ditto			APHA 3500 Ca (B)
Magnesium	Mg/L	ditto	ditto	30	ditto			APHA 3500 Mg (B)
Sulphate	Mg/L	ditto	ditto	200	ditto			APHA 4500 So4 (E)
Nitrate	Mg/L	ditto	ditto	45	ditto			APHA 4500 NO3(B)
Fluoride	Mg/L	ditto	ditto	0.6-1.2	ditto			APHA 4500 F- (D)
Phosphate	Mg/L	ditto	ditto		ditto			APHA 4500 (D)
Sodium	Mg/L	ditto	ditto		ditto			APHA 3500 Na (B)
Potassium	Mg/L	ditto	ditto		ditto			APHA 3500 K (B)
Cyanide	Mg/L	ditto	ditto	0.05	ditto			APHA 4500Cn-(D)

Chromium	Mg/L	ditto	ditto	0.05	ditto			APHA 3500 Cr (B)
Boron	Mg/L	ditto	ditto		ditto			APHA 3500 (B)
SAR	Mg/L	ditto	ditto		ditto			By Calculation
Lead	Mg/L	ditto	ditto	0.05	ditto			APHA 3500 Pb
Cadmium	Mg/L	ditto	ditto	0.01	ditto			APHA 3500 Cd
Mercury	Mg/L	ditto	ditto	0.001	ditto			APHA 3500-Hg
Copper	Mg/L	ditto	ditto	0.05	ditto			APHA 3500-Cu
Ground Water								
Color	Hazen	To be filled after project start	To be filled after project start	5	To be filled	Marthapur Gohira Belabahali Korda	As per CPCB / SPCB norms.	APHA 2120 (B)
Odour		ditto	ditto	UO	ditto			APHA 2150 (B)
Taste		ditto	ditto	Agbl	ditto			2160 Taste-B,C
Conductivity	µmho/cm	ditto	ditto		ditto			APHA 2510 (B)
Turbidly	NTU	ditto	ditto	5	ditto			APHA 2130 B
pH		ditto	ditto	6.5-8.5	ditto			APHA 4500 (B)
COD	Mg/L	ditto	ditto		ditto			APHA 5220(B)

BOD	Mg/L	ditto	ditto		ditto			APHA 5210(B)
Total Hardness	Mg/L	ditto	ditto	300	ditto			APHA 2340 (C)
Iron	Mg/L	ditto	ditto	0.3	ditto			APHA 3500 (B)
Chloride	Mg/L	ditto	ditto	250	ditto			APHA 4500 Cl (B)
Residual Chloride	Mg/L	ditto	ditto	0.2	ditto			APHA 4500 Cl-B,C
Total SS	Mg/L	ditto	ditto		ditto			APHA 2540 (D)
Total DS	Mg/L	ditto	ditto		ditto			APHA 2540 (C)
DO	Mg/L	ditto	ditto		ditto			APHA 4500(B)
Calcium	Mg/L	ditto	ditto	75	ditto			APHA 3500 Ca (B)
Magnesium	Mg/L	ditto	ditto	30	ditto			APHA 3500 Mg (B)
Sulphate	Mg/L	ditto	ditto	200	ditto			APHA 4500 So4 (E)
Nitrate	Mg/L	ditto	ditto	45	ditto			APHA 4500 NO3(B)
Fluoride	Mg/L	ditto	ditto	0.6-1.2	ditto			APHA 4500 F- (D)
Phosphate	Mg/L	ditto	ditto		ditto			APHA 4500 (D)
Sodium	Mg/L	ditto	ditto		ditto			APHA 3500 Na (B)

Potassium	Mg/L	ditto	ditto		ditto			APHA 3500 K (B)
Cyanide	Mg/L	ditto	ditto	0.05	ditto			APHA 4500Cn-(D)
Chromium	Mg/L	ditto	ditto	0.05	ditto			APHA 3500 Cr (B)
Boron	Mg/L	ditto	ditto		ditto			APHA 3500 (B)
SAR	Mg/L	ditto	ditto		ditto			By Calculation
Lead	Mg/L	ditto	ditto	0.05	ditto			APHA 3500 Pb
Cadmium	Mg/L	ditto	ditto	0.01	ditto			APHA 3500 Cd
Mercury	Mg/L	ditto	ditto	0.001	ditto			APHA 3500-Hg
Copper	Mg/L	ditto	ditto	0.05	ditto			APHA 3500-Cu

Noise and Vibration

<table>
<tr><th>Item</th><th>Unit</th><th>Measured Value (Mean)</th><th>Measured Value (Max)</th><th>Indian Standard (NAAQS, 2009)</th><th>Referred International Standard</th><th>Remarks Measurement</th><th>Frequency</th><th>Method</th></tr>
<tr><td>Noise Level</td><td>dB(A)</td><td>To be filled after project start</td><td>To be filled after project start</td><td>
<table>
<tr><th rowspan="2">Area Category</th><th colspan="2">Limits in dB(A)L_{eq}</th></tr>
<tr><th>Day Time (6.00 AM to 10.00 P.M)</th><th>Night Time (10.00PM to 6.00 AM)</th></tr>
<tr><td>Industrial</td><td>75</td><td>70</td></tr>
</table>
</td><td>To be filled</td><td>Damdarpur
Panaspal
Laxminagar
Badapatuli</td><td>Periodically as per CPCB / SPCB norms.</td><td></td></tr>
</table>

				<table><tr><td>Commercial</td><td>65</td><td>55</td></tr><tr><td>Residential</td><td>55</td><td>45</td></tr><tr><td>Silence Zone</td><td>50</td><td>40</td></tr></table>		Korda Belabahali Ghasipura Gohira Ragadi		
Vibration Level	mm/second	ditto	ditto	ditto	ditto	At sensitive receptors & settlements in the adjoining area of tunnel site		

2.1.2 Land Environment

Item	Monitoring Result of Reporting Period	**Remarks** **Measurement Point**	**Frequency**	**Method**
Degradation of land cover	To be filled after project start	1.Construction areas 2.Borrow areas 3.Labour camps		Observation
Soil Erosion	ditto	At high banking zone of Canal sections		Visual observation

2.1.3 Soil Environment

Item	Monitoring Result of Reporting Period	**Remarks Measurement Point**	**Frequency**	**Method**
Degradation of land cover	To be filled after project start	To be filled based on Annex XII		
Soil Erosion	ditto	ditto		

2.1.4 Occupational Health of Workers

Item	Monitoring Result of Reporting Period	**Remarks Measurement Point**	**Frequency**	**Method**
Health of workers may be affected due to unhealthy working conditions.	To be filled after project start	Construction Site / labour camps		

2.1.5 Biodiversity

Item	Monitoring Result of Reporting Period	**Remarks Measurement Point**	**Frequency**	**Method**
Related environmental issues including elephant passages	To be filled after project start	Command Area	Bi-annually	Flora- Quadrant plot Analysis Fauna- Direct method • Sighting • Transit line Indirect Method

		elephant passages	Regular observation	• Feeding Sign • Scat / dung / pellet identification • Hoof / pug marks Information collection from villagers and forest officers to ensure that passage is followed or detoured.

2.2 Operation and Decommission Stages

2.2.1 Pollution

Water Environment

Item	**Unit**	**Measured Value(Mean)**	**Measured Value(Max)**	**Indian Standard (IS:10500 Drinking Water)**	**Referred International Standard**	**Remarks**		
						Measurement Point	**Frequency**	**Method**
Surface Water								
Color	Hazen	*To be filled*	*To be filled*	5	To be filled	Panaspal	At regular interval	APHA 2120 (B)

		after project start	*after project start*			Chadipal Gohira Belabahali Korda Laxminagar		
Odour		ditto	ditto	UO	ditto			APHA 2150 (B)
Taste		ditto	ditto	Agbl	ditto			2160 Taste-B,C
Conductivity	µmho/cm	ditto	ditto		ditto			APHA 2510 (B)
Turbidly	NTU	ditto	ditto	5	ditto			APHA 2130 B
pH		ditto	ditto	6.5-8.5	ditto			APHA 4500 (B)
COD	Mg/L	ditto	ditto		ditto			APHA 5220(B)
BOD	Mg/L	ditto	ditto		ditto			APHA 5210(B)
Total Hardness	Mg/L	ditto	ditto	300	ditto			APHA 2340 (C)
Iron	Mg/L	ditto	ditto	0.3	ditto			APHA 3500 (B)
Chloride	Mg/L	ditto	ditto	250	ditto			APHA 4500 Cl (B)
Residual Chloride	Mg/L	ditto	ditto	0.2	ditto			APHA 4500 Cl-B,C
Total SS	Mg/L	ditto	ditto		ditto			APHA 2540 (D)
Total DS	Mg/L	ditto	ditto		ditto			APHA 2540 (C)
DO	Mg/L	ditto	ditto		ditto			APHA 4500(B)
Calcium	Mg/L	ditto	ditto	75	ditto			APHA 3500 Ca (B)
Magnesium	Mg/L	ditto	ditto	30	ditto			APHA 3500 Mg (B)
Sulphate	Mg/L	ditto	ditto	200	ditto			APHA 4500 So4 (E)
Nitrate	Mg/L	ditto	ditto	45	ditto			APHA 4500 NO3(B)
Fluoride	Mg/L	ditto	ditto	0.6-1.2	ditto			APHA 4500 F- (D)
Phosphate	Mg/L	ditto	ditto		ditto			APHA 4500 (D)
Sodium	Mg/L	ditto	ditto		ditto			APHA 3500 Na (B)

Potassium	Mg/L	ditto	ditto		ditto			APHA 3500 K (B)
Cyanide	Mg/L	ditto	ditto	0.05	ditto			APHA 4500Cn-(D)
Chromium	Mg/L	ditto	ditto	0.05	ditto			APHA 3500 Cr (B)
Boron	Mg/L	ditto	ditto		ditto			APHA 3500 (B)
SAR	Mg/L	ditto	ditto		ditto			By Calculation
Lead	Mg/L	ditto	ditto	0.05	ditto			APHA 3500 Pb
Cadmium	Mg/L	ditto	ditto	0.01	ditto			APHA 3500 Cd
Mercury	Mg/L	ditto	ditto	0.001	ditto			APHA 3500-Hg
Copper	Mg/L	ditto	ditto	0.05	ditto			APHA 3500-Cu
Ground Water								
Color	Hazen	To be filled after project start	To be filled after project start	5	To be filled	Marthapur Gohira Belabahali Korda	At regular interval	APHA 2120 (B)
Odour		ditto	ditto	UO	ditto			APHA 2150 (B)
Taste		ditto	ditto	Agbl	ditto			2160 Taste-B,C
Conductivity	µmho/cm	ditto	ditto		ditto			APHA 2510 (B)
Turbidly	NTU	ditto	ditto	5	ditto			APHA 2130 B
pH		ditto	ditto	6.5-8.5	ditto			APHA 4500 (B)
COD	Mg/L	ditto	ditto		ditto			APHA 5220(B)
BOD	Mg/L	ditto	ditto		ditto			APHA 5210(B)
Total Hardness	Mg/L	ditto	ditto	300	ditto			APHA 2340 (C)
Iron	Mg/L	ditto	ditto	0.3	ditto			APHA 3500 (B)
Chloride	Mg/L	ditto	ditto	250	ditto			APHA 4500 Cl (B)

Residual Chloride	Mg/L	ditto	ditto	0.2	ditto			APHA 4500 Cl-B,C
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Total DS	Mg/L	ditto	ditto		ditto			APHA 2540 (C)
DO	Mg/L	ditto	ditto		ditto			APHA 4500(B)
Calcium	Mg/L	ditto	ditto	75	ditto			APHA 3500 Ca (B)
Magnesium	Mg/L	ditto	ditto	30	ditto			APHA 3500 Mg (B)
Sulphate	Mg/L	ditto	ditto	200	ditto			APHA 4500 So4 (E)
Nitrate	Mg/L	ditto	ditto	45	ditto			APHA 4500 NO3(B)
Fluoride	Mg/L	ditto	ditto	0.6-1.2	ditto			APHA 4500 F- (D)
Phosphate	Mg/L	ditto	ditto		ditto			APHA 4500 (D)
Sodium	Mg/L	ditto	ditto		ditto			APHA 3500 Na (B)
Potassium	Mg/L	ditto	ditto		ditto			APHA 3500 K (B)
Cyanide	Mg/L	ditto	ditto	0.05	ditto			APHA 4500Cn-(D)
Chromium	Mg/L	ditto	ditto	0.05	ditto			APHA 3500 Cr (B)
Boron	Mg/L	ditto	ditto		ditto			APHA 3500 (B)
SAR	Mg/L	ditto	ditto		ditto			By Calculation
Lead	Mg/L	ditto	ditto	0.05	ditto			APHA 3500 Pb
Cadmium	Mg/L	ditto	ditto	0.01	ditto			APHA 3500 Cd
Mercury	Mg/L	ditto	ditto	0.001	ditto			APHA 3500-Hg
Copper	Mg/L	ditto	ditto	0.05	ditto			APHA 3500-Cu

Ground Water Level								
Change in ground water level	mbgl	To be filled after project start	To be filled after project start	To be filled	To be filled	Chandipal Damadarpur Panasapal (Hudisahi Village) Laxminagar Belbahali Ragadi Barundei Ranapur Chandali Bamphidi Suano Barakhai Dhuligarh Ramachandrapur (Manoharpur) Ankurapal Sukinda Haripur Nua-Nilakanthapur Gadagaunpur	Once in Post Monsoon & Once in Pre Monsoon	

						Kansargada Bambilo		
Water logging & drainage								
Water logging & drainage water level	Sq. km	To be filled after project start	To be filled after project start	To be filled	To be filled	Low lying areas of command area	In the peak monsoon season & at the time of full flow in the canal	
Weed infestation in the water body								
Water logging & drainage water level	To be filled	To be filled after project start	To be filled after project start	To be filled	To be filled	Stagnant areas of surface water body.	Post-monsoon period	
Wastage of water								
Wastage of water	To be filled	To be filled after project start	To be filled after project start	To be filled	To be filled	Command area	During Rabi & Khariff	

2.2.2 Soil Environment

Item	**Unit**	**Measured Value(Mean)**	**Measured Value(Max)**	**Indian Standard**	**Referred International Standard**	**Remarks Measurement Point**	**Frequency**	**Method**
Soil fertility may be affected								
EC	Micro	ditto	ditto	ditto	ditto	Ghasipura	At regular	EC metr (hesse, 1972)

	mho/cm					Laxminagar Garudabandi Damdarpur Korda Gohira Panaspal Kansargoda Belabahali	intervals to be decided by PMU	
OM	**%**	ditto	ditto	ditto	ditto			Walkely & Black method
Total Nitrogen- by Mico-kjeldahl method	mg/100g	ditto	ditto	ditto	ditto			Mico-kjeldahl method
Available Phosphorous – by Olsen's method	mg/100g	ditto	ditto	ditto	ditto			Olsen's method
Calcium & Magnesium – by Versene method	Meq/100 g	ditto	ditto	ditto	ditto			Versene method
Sodium & Potassium – by Flame photometer	mg/100g	ditto	ditto	ditto	ditto			Flame photometer
Use of agrochemicals								
Dosage of fertilizers, pesticides, insecticides etc. specified by Dept. of Agriculture,	ditto	ditto	ditto	ditto	ditto	Command Area	At regular intervals to be decided by PMU	

Govt. of Odisha								

2.2.3 Biodiversity

Item	Monitoring Result of Reporting Period	**Remarks** **Measurement Point**	**Frequency**	**Method**
Related environmental issues including elephant passages	To be filled after project start	Command Area	Bi-annually	Flora- Quadrant plot Analysis Fauna- Direct method • Sighting • Transit line Indirect Method • Feeding Sign • Scat / dung / pellet identification • Hoof / pug marks
		elephant passages	Regular observation	Information collection from villagers and forest officers to ensure that passage is followed or detoured.

Annexure No. XIX

Environmental Checklist for the Rengali Irrigation Project LBC-II Phase-II

(To appraise JICA's FF Mission)

Category	Environmental Item	Main Check Items	Yes: Y No: N	The reason of Yes/No, Supposed mitigation measures and Remarks
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a)Y (b)Y (c)Y (d)Y	(a)(b) EIA of entire the Rengali Irrigation Project was already approved by MoEF in 1996, and the Environmental Clearance (EC) is still valid. Further EIA study has been done to meet JICA requirements. (b) The final EIA report is being processed by DoWR (GoO) level. (c) DOWR intends to meet the conditions based on 1996 EC (MoEF). Compliance to stipulated EC conditions furnished. Stage II forest clearance is processed at MoEF. (d) According to EIA, some environmental permission such as logging permission is required on relevant laws and regulations.
	(2) Explanation to the Local stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a)Y (b) Y	Information disclosure and exchange opinions with stakeholders have been conducted in stakeholder meetings (SHM) on the EIA and RRP. So far SHMs Processed at 35 villages by May 2014. Additional stakeholder meetings are proposed to be conducted in some other area based on the SHM action plan which DOWR prepares. EIA and RRP report describes that the comments from stakeholders are supportive of project implementation.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a)Y	Project alternatives are discussed in the EIA report

Category	Environmental Item	Main Check Items	Yes: Y No: N	The reason of Yes/No, Supposed mitigation measures and Remarks
2 Pollution Control	(1) Air Pollution	(a) Are adequate baseline field surveys conducted?	(a)Y	Baseline surveys as post monsoon season were conducted for relevant environmental components.
		(b) Does air pollution by the construction comply with the country's standards?	(b)Y	Air pollution is unlikely in this irrigation projects except during the construction phase Mitigation measures has been suggested in the EIA report
	(2) Water and Sediment Pollution	(a) Are adequate baselines field surveys conducted?	(a)Y	(a) Baseline surveys were conducted during end of monsoon and post monsoon period
		(b)Are mitigation measures for rivers and ground water pollution from irrigated farm land conducted?	(b)Y	(b) Mitigation measures against water pollution are suggested in EIA reports
		(c) Is water quality of river and groundwater monitoring plan monitored?	(c)Y	(c) Water quality monitoring plan against likely pollution during construction and operation phases is indicated in the EIA report.
		(d) Is the agrochemicals management plan which describes how to use them?	(d)Y	(d) Broadly discussed in management chapter of EIA
	(3)Ground water level and Subsidence	(a) Are adequate baselines field surveys conducted?	(a)Y	Baseline survey of GW levels was conducted at 21 Stations
		(b) Is there a possibility that the extraction of groundwater by tunnel construction will cause decrease of ground water and subsidence?	(b)N	There may not be any subsidence of GW Levels due to construction of tunnel, which is proposed to be lined. The environmental management and monitoring plan of GW Levels are discussed in EIA report.
	(4)Soil Pollution	(a)Is salt pollution caused by irrigation?	(a)N	(a) No soil salinity is observed on baseline survey in the phase I command area. Therefore salt pollution isn't predicted in phase II area because of similarity with phase I.
		(b)Are mitigation measures for agrochemicals and heavy metal pollution conducted?	(b)Y	(b) and (c) The environmental management and monitoring plan of agrochemicals and heavy metal are discussed in EIA report.
		(c) Is the agrochemicals management plan which describes how to use them?	(c)Y	
	(5) Noise and Vibration	(a) Are adequate baselines field surveys conducted?	(a)Y	(a) Baseline surveys were conducted.
		(b) Do noise and vibrations by the construction comply with the country's standards?	(b)Y	(b) Anticipated vibration levels during tunneling will not disturb any significant structure The environmental management and monitoring plan of noise and vibration are discussed in EIA report.
	(6) Wastes	(a) Are wastes generated from the project construction, such as canals and tunnels, properly treated and disposed of in accordance with the country's regulations?	(a)Y	(a) Spoil materials from excavation and tunneling will be taken away to build up low lying areas in conformity to country's regulations. Necessary permission will be taken.
	(7)Disaster	(a) Does the project have measures against disasters such as flood	(a)Y	(a) The command area remains in the Doab of river Brahmani and Baitarani and

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		and earthquake?		Kharsuan. Most of the areas lie above the normal flood level. In low lying areas flood management will be handled by DoWR. The structures such as crossing bridges and aqueduct bridges will be made quakeproof.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas? (b) Is the project site located in reserved forest or protected forest?	(a)N (b)Y	(a) LBC II Phase II does not come in schedule of protected area. The project will not affect any protected areas. (b) The LBC II during traverse meets 773ha forest area. The conditions on the forest clearance are processed by department of forest.
	(2) Flora, fauna and biodiversity	(a) Are adequate baselines field surveys conducted? (b) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g.wetland)? (c) Does the project site encompass the protected habitats of endangered species (e.g. Elephant) designated by the country's laws or international treaties and conventions? (d) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (e) Are adequate mitigation measures taken to prevent impacts, such as destruction of forest, disruption of migration routes (e.g. Elephant Corridor) and habitat fragmentation? (f) Is there a possibility that construction of irrigation facilities will have impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?	(a)Y (b)N (c)N (d)N (e)Y (f)N	(a) Baseline field surveys were conducted as mentioned in the EIA report (b) LBC II Phase II does not meet such habitats. (c) LBC II Phase II does not encompass the protected habitats. (d) No significant ecological impacts anticipated. (e) i. New forest will be created against forest area taken bu the project. ii. The wildlife management plan including the mitigation measures for elephant movement is planned for implementation. (f) i.No possibility of such impact is foreseen. ii. Only strips of land for taking the canal alignment. iii. Appropriate conservation measures have been suggested in EIA document.
	(3) Hydrological situation	(a) Is there a possibility that alteration of topographic features and installation of structures, such as canals and tunnels will adversely affect surface water and groundwater flows?	(a)Y	(a) The canals have been designed not to adversely affect surface and ground water flows. Necessary structures have been designed at required sites.

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	(4) Topography and Geology	(a) Is there a soft ground on the canal alignment that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff or erosion will result from irrigated areas, cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a)N (b)N (c)Y	(a) There is no soft ground in the project area. The geological survey in the tunnel is conducted during planning. Canal slopes will be observed after completion and wherever needed lining and other remedial measures will be taken. Adequate measures have been considered to prevent likely slope failures or landslides on huge earth fill banks. Lining and plantation will be provided to prevent possible soil erosion on canal banks, borrow areas will be leveled and waste soil disposal areas will be trained to avoid slides.
	(5)Landscape	(a) Is there a possibility that the project will adversely affect the local natural and rural landscape? Are necessary measures taken?	(a)N	(a) The project will not adversely affect the local natural and rural landscape.
	(6)Global warming	(a) Does the project have measures against climate change such as huge cyclone? (b) Does the project emit the global warming gas?	(a)N (b)N	(a) The project design has accounted for climate change measures. (b) Very minimum CO2 gas will be emitted by machinery only in construction phase.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the	(a)Y (b)Y (c)Y (d)Y (e)Y	(a) Displaced Families (DF) are all non-title holders (squatters). Compensation for structures (houses and others) is paid (1.3 times of value). Land is given as well in certain conditions. (b) It is being done by the LAO and monitored by R&R Committee. (c) RR plan will be prepared following Section 16 of LARR Act 2013. Adequate compensation for replacement is paid. Training for self employment is given to willing DF. (d) Yes, it is stipulated in the law. (e) Yes, document will take care of compensation backed up by LARR Act 2013. (f) Yes, Special treatment is proposed for vulnerable groups (ST and SC families).

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		elderly, people below the poverty line, ethnic minorities, and indigenous peoples?	(f)Y	
		(g) Are agreements with the affected people obtained prior to resettlement?	(g)Y	(g) The R&R plan continues to be discussed with AFs.
		(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	(h)Y	(h) New institutional arrangement is proposed in LARR Act 2013. Capacity and budget will be secured to implement the plan.
		(i) Are any plans developed to monitor the impacts of resettlement?	(i)Y	(i)It is planned.
		(j) Is the grievance redress mechanism established?	(j)Y	(j) It is planned to be established as per LARR Act 2013.
	(2) Living and Livelihood	(a) Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?	(a)Y	(a) The Project causes almost positive impact to local socio-economy because of increased crop productivities. The adequate RRP is being prepared to minimize the impact to the local socio-economy.
		(b) Is there a possibility that the project will cause significant impacts, such as destruction of social infrastructure and services? Are adequate measures considered for preventing these impacts?	(b)N	(b) Destruction of social infrastructure and services are not anticipated.
		(c) Is there any possibility that the project will adversely affect the living conditions of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	(c)N	(c) The project will not adversely affect the living condition of neither the inhabitants nor the affected inhabitants. Availability of irrigation will positively improve the living condition of all inhabitants.
		(d)Are rights of farmland-use allocated local farmer adequately?	(d)Y	(d) Farmers have adequate right to use their farm lands.
		(e)Are water rights allocated local farmer adequately?	(e)Y	(e) Water rights are allocated adequately.
		(f) Is there a possibility that water use from river by the project will cause significant impacts to local people such as fisherman in the downstream area?	(f)N	(f) Significant impact to fisherman is not anticipated because of continuance of flow to the downstream areas.
		(g) Is there any possibility that diseases related to water, such as malaria, schistosomias is associated with the project? Are adequate considerations given to public health, if necessary?	(g)Y	(g) The project area is malaria prone area. The project will not aggravate the situation; rather its well planned drainage system will minimize such incidence. Department of Health takes care of health aspects of the people of project area.
		(h) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of	(h)N	(h) Large scale immigration of laborers is not anticipated as construction activities are mostly mechanized. Department of health makes people conscious

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		workers associated with the project? Are adequate considerations given to public health, if necessary?		over health measures and takes preventive measures whenever needed.
		(i) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increases in traffic congestion and traffic accidents)?	(i)Y	(i)Adequate measures against traffic congestion and accident is planned to be conducted.
		(j) Is there any possibility that canals will impede the movement of inhabitants?	(j)N	(j) Adequate canal crossing (Bridges) will be constructed in consultation with local people.
4 Social Environment	(3) Cultural Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a)N	(a) The canal alignment is so planned that non of the existing local archeological, historical, cultural and religious heritage are affected.
	(4) Ethnic Minorities Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities such as scheduled tribes and scheduled caste?	(a)Y	(a) Impact on these ethnic minorities are not expected..
		(b) Are all of the rights of ethnic peoples in relation to land and resources respected?	(b)Y	(b) Those rights shall not be infringed.
	(6) Working Conditions (Occupational Safety)	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	(a)N	(a) DOWR being an organ of the government complies with the country's laws and ordinances.
		(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	(b)Y	(b) DOWR considers the tangible safety considerations in place for individuals involved in the project during execution.
		(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	(c)Y	(c) DOWR being an organ of the government plans and implements tangible measures such as traffic safety and public health for labors and workers.
		(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(d)Y	(d) DOWR takes appropriate safety measures of other individuals involved and local residents. Labor camps will be settle far from the local villages.

Category	Environmental Item	Main Check Items	Yes: Y No: N	The reason of Yes/No, Supposed mitigation measures and Remarks
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	(a)Y	(a) The mitigation measure, the environmental management and monitoring plan during construction are discussed in EIA report.
		(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	(b)Y	(b) The mitigation measure, the environmental management and monitoring plan for natural environment are discussed in EIA report.
		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(c)Y	(c) The mitigation measure, the environmental management and monitoring plan during construction are discussed in EIA report.
	(2) Environmental Management and Monitoring	(a) Does the proponent develop and implement Environmental and Social Management Plan (ESMP) and Environmental and Social Monitoring Plan (ESMoP) for the environmental items that are considered to have potential impacts?	(a)Y	(a) DOWR prepares and implements ESMP and ESMoP as discussed in the EIA report
		(b) What are the items, methods and frequencies of the monitoring program?	(b)Y	(b) Items, methods and frequencies of ESMoP are mentioned in EIA report.
		(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	(c)Y	(c) Framework of ESMoP is suggested in EIA report.
		(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(d)Y	(d) Government of India guidelines in this regard stipulates monitoring framework, format, frequency and organizations. This shall be followed.